

Fishery Management Report No. 14-07

Kodiak Management Area Herring Fisheries Annual Management Report, 2011

by

Geoff Spalinger

February 2014

Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative		<i>all standard mathematical</i>	
deciliter	dL	Code	AAC	<i>signs, symbols and</i>	
gram	g	all commonly accepted		<i>abbreviations</i>	
hectare	ha	abbreviations	e.g., Mr., Mrs.,	alternate hypothesis	H _A
kilogram	kg		AM, PM, etc.	base of natural logarithm	e
kilometer	km	all commonly accepted		catch per unit effort	CPUE
liter	L	professional titles	e.g., Dr., Ph.D.,	coefficient of variation	CV
meter	m		R.N., etc.	common test statistics	(F, t, χ^2 , etc.)
milliliter	mL	at	@	confidence interval	CI
millimeter	mm	compass directions:		correlation coefficient	
		east	E	(multiple)	R
		north	N	correlation coefficient	
		south	S	(simple)	r
		west	W	covariance	cov
		copyright	©	degree (angular)	°
		corporate suffixes:		degrees of freedom	df
		Company	Co.	expected value	E
		Corporation	Corp.	greater than	>
		Incorporated	Inc.	greater than or equal to	≥
		Limited	Ltd.	harvest per unit effort	HPUE
		District of Columbia	D.C.	less than	<
		et alii (and others)	et al.	less than or equal to	≤
		et cetera (and so forth)	etc.	logarithm (natural)	ln
		exempli gratia		logarithm (base 10)	log
		(for example)	e.g.	logarithm (specify base)	log ₂ etc.
		Federal Information		minute (angular)	'
		Code	FIC	not significant	NS
		id est (that is)	i.e.	null hypothesis	H ₀
		latitude or longitude	lat or long	percent	%
		monetary symbols		probability	P
		(U.S.)	\$, ¢	probability of a type I error	
		months (tables and		(rejection of the null	
		figures): first three		hypothesis when true)	α
		letters	Jan,...,Dec	probability of a type II error	
		registered trademark	®	(acceptance of the null	
		trademark	™	hypothesis when false)	β
		United States		second (angular)	"
		(adjective)	U.S.	standard deviation	SD
		United States of		standard error	SE
		America (noun)	USA	variance	
		U.S.C.	United States	population	Var
			Code	sample	var
		U.S. state	use two-letter		
			abbreviations		
			(e.g., AK, WA)		
Weights and measures (English)					
cubic feet per second	ft ³ /s				
foot	ft				
gallon	gal				
inch	in				
mile	mi				
nautical mile	nmi				
ounce	oz				
pound	lb				
quart	qt				
yard	yd				
Time and temperature					
day	d				
degrees Celsius	°C				
degrees Fahrenheit	°F				
degrees kelvin	K				
hour	h				
minute	min				
second	s				
Physics and chemistry					
all atomic symbols					
alternating current	AC				
ampere	A				
calorie	cal				
direct current	DC				
hertz	Hz				
horsepower	hp				
hydrogen ion activity	pH				
(negative log of)					
parts per million	ppm				
parts per thousand	ppt, ‰				
volts	V				
watts	W				

FISHERY MANAGEMENT REPORT NO. 14-07

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ANNUAL MANAGEMENT REPORT, 2011**

by

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ABSTRACT

This report presents information concerning the commercial Pacific herring *Clupea pallasii* sac roe, food and bait, and subsistence fisheries in the Kodiak Management Area (KMA) in 2011.

The KMA 2011 herring sac roe fishery was open from April 15 through June 30. Fishermen harvested 2,957 tons, compared to the preseason guideline harvest level (GHL) of 6,135 tons. Prior to May 1, the herring sac roe fishery is managed under an allocative harvest strategy that provides approximately 75% of the total Kodiak GHL to seine gear and approximately 25% to gillnet gear. From May 1 through June 30, the Alaska Department of Fish and Game (ADF&G) may open any area with a remaining GHL to any gear group if the fishery is unlikely to result in overharvest. Purse seine fishermen harvested 2,937 tons, approximately 99% of the total catch, and gillnet fishermen harvested 20 tons, approximately 1% of the total catch. Roe recovery percentages averaged 10.8% for the fishery. The total exvessel value of the fishery was an estimated \$591,400. The harvest was composed primarily of 9.3% age-4, 5.9% age-5, 63.0% age-6, 15.2% age-7, 2.7% age-8, 1.5% age-9, and 1.1% age-10.

A combine fishery was conducted for the KMA herring food and bait fishery for the 2001 to 2011 seasons due to the small GHLs. Food and bait harvests totaled 212 tons with 127 tons (180-ton GHL) coming from the Uganik District and 85 tons (70-ton GHL) from the South Afognak District. The Eastside District (155-ton GHL) could have been opened; however, no requests were made to ADF&G to open this district.

Subsistence herring harvests were reported from a total of 8 subsistence permits. The total subsistence herring harvest for the KMA in 2011 was 360 pounds.

Key words: Kodiak, herring, *Clupea pallasii*, sac roe commercial fishery, food and bait commercial fishery, subsistence fishery, stock status, GHL, KMA, AMR.

INTRODUCTION

This report presents information on the commercial Pacific herring *Clupea pallasii* sac roe, food and bait, and subsistence fisheries in the Kodiak Management Area (KMA) in 2011. This includes harvest data by fishery, age and weight data collected from the commercial harvest, stock status, and a summary of fishery management activity.

The KMA comprises the waters of the Kodiak Archipelago and that portion of the Alaska Peninsula extending from Cape Douglas southwest to Kilokak Rocks (Figure 1). The archipelago is approximately 250 kilometers (150 miles) long, extending from Shuyak Island in the North to the Trinity Islands in the South. The Alaska Peninsula portion of the KMA is about 267 kilometers (160 miles) long and is separated from the archipelago by Shelikof Strait (Figure 1).

The KMA is divided into 13 districts which define geographical areas used to manage both the herring sac roe and the food and bait fisheries (Figures 2–10). For the sac roe fishery, each district is divided into sections that define the spawning area used by specific herring stocks or a geographical area.

HERRING SAC ROE FISHERY

FISHERY CHARACTERISTICS

The KMA herring sac roe fishery began in 1964 (Table 1; Figure 11) and occurs in approximately 30 bays and coastal locations. The fishery currently opens at NOON on April 15, with most of the management area opening concurrently. This opening, prior to any major buildup of herring, was historically intended to distribute effort and harvest; however, in recent years, purse seine fishermen have concentrated in areas known to have early spawning herring and the largest guideline harvest levels (GHLs). The fishery ends on June 30 (5 AAC 27.510(a)).

Gear

Purse seines and gillnets are the only gear types allowed in the commercial sac roe fishery. Purse seines may not exceed 18 fathoms stretch measure in depth or 100 fathoms in length (5 AAC 27.525(a)). Gillnets may not exceed an aggregate length of 150 fathoms (5 AAC 27.520(a)).

Fishing Periods

From April 15 through May 7, fishing periods for purse seiners are from NOON until 9:00 PM on odd-numbered days and from 9:00 AM to NOON on even-numbered days. From May 8 through June 30, fishing periods for purse seiners are from NOON until 10:00 PM on odd-numbered days and from 9:00 AM to NOON on even-numbered days (5 AAC 27.510(a)(1)). For gillnets, fishing periods are from NOON on odd-numbered days until NOON on even-numbered days (5 AAC 27.510(a)(2)).

Harvest Strategy

The herring sac roe fishery is managed under an allocative harvest strategy that has been in effect since 2000 with some modifications in 2008 and 2009. The harvest strategy requires the Alaska Department of Fish and Game (ADF&G) to establish GHLS by section, based on historical harvest data, current and past fishery performance, age composition of commercial catch samples, aerial surveys, and hydroacoustic biomass assessments. For each district that has more than one section open to fishing, ADF&G is required to assign 20% to 30% of the GHL to gillnet permit holders and 70% to 80% of the GHL to purse seine permit holders (5 AAC 27.535(e)(2)(D)). This is accomplished by designating one gear type for each section with a GHL. In districts where assigning one gear type for each section would not achieve the required allocation, the department establishes GHLS for both gear types, within a section, and fishing is separated by time or area. Adjacent sections may be combined and managed as a single section if the same stock is present or moves between sections (5 AAC 27.535(e)(1)(A)). ADF&G may also use emergency order (EO) authority to restrict fishing time in any section if overharvest concerns exist or to open additional areas during the season.

Recent regulation changes made by the Alaska Board of Fisheries (BOF) allow ADF&G to open any area from May 1 through June 30, with a remaining GHL to any gear group if the fishery is not likely to result in overharvest (5 AAC 27.535(e)(1)(C)). Also, after April 30, permit holders must be registered with ADF&G before participating in the fishery (5 AAC 27.510(a)(4)).

FISHERY MANAGEMENT

Establishing GHLS

Preseason GHLS are established for all sections that have produced consistent herring harvests in previous seasons. These GHLS reflect the status of a particular herring stock by section. In 2011, section GHLS ranged from 10 to 1,700 tons (Table 2). Establishing the 2011 GHLS involved the evaluation of a variety of information to determine stock status trends and conservative adjustment of GHLS, including

1. fishery performance during preceding season or seasons (i.e., harvest timing, harvest duration, average school size);

2. trends in age composition (i.e., level of recruitment of age-3 herring, the proportion of age-5 and younger herring, and the proportion of age-2 herring as an indicator of future recruit strength);
3. observations of spawn and juvenile herring;
4. industry and department aerial surveys;
5. hydroacoustic surveys; and,
6. test fishery data including age composition and biomass estimates.

Preseason GHGs have generally reflected the actual harvests and have aided fishermen and processors in planning prior to the start of each season.

ADF&G has historically relied on the fishing industry to establish roe recovery and minimum size standards. The quality of Kodiak herring has generally been high, due to selective harvest of mature herring by fishermen and the inseason processing of relatively small amounts of herring over long time periods by local processors. In the 1990s, competition in the purse seine fishery intensified and fishermen were less selective in harvesting high-quality herring. In 2003 and 2004, ADF&G took a more active role in some sections to manage for roe quality, which resulted in delayed openings of sections and an increase in roe quality. During the 2005 BOF meeting, the harvest strategy was changed so that the department is directed to strive for the highest quality product (5 AAC 27.535(e)(6)).

Inseason Fishery Management

Inseason, processors and independent tender operators are required to provide daily tallies of herring tonnage and deliveries by section, as well as accurate estimates of herring tonnage onboard tenders that have not yet delivered to the processor. Reports from field personnel, processors, permit holders, spotter pilots, and tenders are tallied by ADF&G to assess herring harvests. Generally, once the harvest estimate approaches, meets, or exceeds the GHG, a section is closed for the season by EO. Due to the rapid pace at which some harvests occur, inperiod closures are frequent. In sections that have field personnel present on the grounds, inperiod closures may occur with only a few minutes of advance notice.

2011 SEASON SUMMARY

Due to poor market conditions the price of herring was the lowest on record. As a result the fishery also had the fewest number of participants and the harvest was approximately half of the preseason GHG (Table 2).

The 2011 sac roe season opened at NOON April 15. The last harvest occurred on June 1 and 24 EOs were issued during the season (Figure 12; Appendix A1). The total 2011 KMA GHG was established at 6,135 tons and 2,957 tons were harvested (Table 3; Figure 13).

In 2011, 14 purse seine permit holders made 95 landings harvesting 2,937 tons. A total of three gillnet permit holders harvested 20 tons in 6 landings (Table 3; Figure 14). Purse seine fishermen harvested approximately 99% and gillnet fishermen harvested the remaining 1% of the total KMA harvest in 2011 (Figure 15). The 2011 average individual purse seine permit holder harvest was 210 tons, the highest average harvest on record. The 2011 average individual gillnet permit holder harvest was approximately 7 tons (Table 3). Five companies operated 6 shore-based processing facilities to buy and process herring.

ADF&G monitored the fishery with one shore-based field crew and two research vessels, all of which were stationed in anticipated herring harvest locations. Vessels and the crew gathered effort and harvest data used to manage the fishery, and collected commercial catch samples to obtain age, weight, length (AWL), and maturity data.

There were a total of 52 sections open to fishing; however, 13 sections were exploratory that have little or no historic harvests. Harvests occurred within 16 sections and the remaining sections were either not fished or no harvest occurred. There were 24 EOs issued concerning the fishery (Appendix A1).

Purse Seine Fishery

Purse seiners harvested fewer herring in fewer areas during 2011 compared to recent years. This was primarily due to the small fleet size. The majority of the harvest occurred in the combined Village Islands/Uganik Bay sections of the Uganik District (1,561 tons), the Danger Bay Section of the South Afognak District (431 tons), and the Outer Ugak Bay Section of the Eastside District (299 tons; Table 2). Opening day effort in the Eastside District, an area with traditional early spawn, is usually substantial. In 2011, the few participants that did fish, chose to begin the season fishing elsewhere. As a result, only 508 tons were harvested in the Eastside District compared to the preseason GHF of 1,550 tons, most from the Outer Ugak Section. In addition to the 431 tons from the Danger Bay Section of the Afognak districts, 124 tons were harvested from the combined Izhut/Kitot/MacDonald Lagoon sections. 198 tons were harvested from the Inner Marmot District all from the Kizhuyak Bay Section. Only 64 tons were harvested from the Alitak District, far less than the GHF of 1,375 tons. The Inner Uyak Bay Section of the Uyak District did not open due to low herring abundance. Purse seiners harvest 52 tons from the Womens Bay Section which had a GHF of 50 tons (Table 2). Roe recovery from purse seine harvests averaged 10.8 % (Figure 16).

Gillnet Fishery

Gillnet effort was expected to be minimal in 2011. As a result, ADF&G opened areas initially allocated to the gillnet fleet by EO to continuous fishing beginning at NOON on April 15 (Appendix A1). Normally gillnet areas follow a fishing schedule that allows them to fish from NOON on even-numbered days until NOON on odd-numbered days (24-hour open periods followed by 24-hour closed periods).

Gillnet permit holders harvested 20 tons, the lowest since 2008, and the second lowest on record (Table 3). Small harvests occurred in the combined Village Islands/Uganik Bay sections and the Browns Lagoon Section (Table 2). Roe recovery from gillnet harvests averaged 9.0% (Figure 16).

Inseason Gear Changes

Based on BOF changes to the regulations enacted in February, 2009, ADF&G has the authority to allow any gear group access to a section with a remaining GHF after April 30, if the fishery is unlikely to result in overharvest (5 AAC 27.535(e)(1)(C)). Beginning NOON May 1, the following sections were opened to both gear types: the Inner Alitak Bay, Inner/Outer Deadman bays, East Upper Olga Bay, West Upper Olga Bay, Sulua Bay, Lower Olga Bay, Three Saints Bay, West Sitkalidak, Barling Bay, East Sitkalidak, Inner Ugak Bay, Viekoda Bay, Terror Bay, West Uganik Passage, and Tonki Bay sections. The following sections opened to both gear types at some time after May when ADF&G had the necessary coverage to monitor the fisheries: the

Shearwater, Inner Kiliuda, and Womens Bay sections (Appendix A1). An additional 410 tons were harvested as a result of these changes.

Exvessel Value of the Fishery

In 2011 the exvessel price paid for 10% roe recovery herring was approximately \$200 per ton at the dock, the lowest since 1979 (Table 3). The estimated average exvessel earnings per purse seine permit holder was \$41,957 and \$1,333 for gillnet permit holders (Figure 17). The total exvessel value of the 2011 fishery was also the lowest on record worth an estimated \$591,400 (Table 3; Figure 18), which does not include any adjustments in value for roe recovery above or below 10% recovery, herring that are sold as bait, or herring that were discarded. Roe recovery averaged 10.8% (Figure 16).

STOCK ASSESSMENT

ADF&G evaluates fishery performance and survey information to assess trends in stock status. Hydroacoustic and aerial surveys are conducted by ADF&G to assess herring abundance prior to, during, and after the commercial fishery and to survey closed sections. Herring samples come from commercial harvests and from research vessels (using trawl gear). Age composition information from these samples provide insight into recruitment and aid managers in making GHL adjustments. For example, areas with strong percentages of age-4 and younger herring (recruitment) will not be aggressively fished and will have conservative GHLs, whereas areas with older age classes (9 or more years old) will be more aggressively fished with increased GHLs.

Industry aerial observers and permit holders have aided managers by providing biomass estimates, spawn observations, fleet movements, and harvest estimates. Although aerial and hydroacoustic assessments provide an evaluation of the biomass, there are problems associated with herring assessment in the KMA. These include the following problems:

1. Herring tend to be deeper during the day and rise toward the surface during the evening and early morning hours, limiting the time fish are observable from the air.
2. Most fishing sections have several distinct schools of herring that spawn from April through June, making complete biomass estimates difficult.
3. Herring may stay within an area for the duration of the sac roe season or may move to another district, which may lead to duplicated or incomplete biomass estimates, or incorrect assignment to a spawning stock location.
4. The KMA encompasses a large geographical area.
5. Adverse weather conditions limit the extent of surveys.
6. Hydroacoustic surveys are limited in shallower waters, and vessel avoidance by herring is known to occur (Hjellvik et al. 2008).
7. A substantial amount of subtidal spawning may occur in water 10 to 20 fathoms in depth, which is not detectable from aerial surveys.

Catch Sampling

A total of 4,150 herring were collected and analyzed for AWL data from harvests and ADF&G trawl samples during the 2011 sac roe season. Samples were taken from 12 sections, 10 of which

had commercial harvests. Age-6 herring were the dominant age class harvested in 2011, representing approximately 63% of the total commercial harvest (Table 4). The complete commercial harvest consisted of 0.9% age-3, 9.3% age-4, 5.9% age-5, 63.0% age-6, 15.2% age-7, 2.7% age-8, 1.5% age-9, 1.1% age-10, 0.2% age-11, and 0.1% age-12 herring (Table 4). Herring weights in 2011 were fairly consistent throughout the Kodiak Archipelago (Table 5).

Stock Status by District

Herring can generally be found seasonally in all bays of the KMA (Figure 2). ADF&G monitors approximately 70 sections that are known to have spawning populations of herring, with the majority of effort spent on larger herring stocks. Generally, there is less information available for the smaller stocks of herring so the evaluation of these stocks is more tenuous. In some areas, such as in the Mainland districts, several years may elapse before new information becomes available. ADF&G also considers information provided by commercial herring fishermen, spotter pilots, air taxi operators, and remote area residents concerning herring distribution, biomass estimates, and spawn sightings.

North Afognak District

Five sections compose the North Afognak District (Figure 3). Spawning stocks of herring occur in all five sections, although these stocks tend to be small (less than 20 tons). The Tonki Bay Section currently has the largest biomass, and had a GHF of 40 tons in 2011. The Perenosa Bay Section was open to gillnet gear in 2011 with a 10-ton GHF and the Delphin Bay Section was open as exploratory. No harvests occurred in the North Afognak District.

West Afognak District

The West Afognak District has six sections, five of which are known to have spawning stocks of herring (Figure 3). Paramanof Bay has the largest spawning stock within this district; however, this stock has been at low levels since 2005. This stock appeared to be rebuilding, however, low biomass estimates in 2010 prompted ADF&G to close this section in 2011. Hydroacoustic and aerial surveys in 2011 did not locate herring.

South Afognak District

The South Afognak District comprises six sections and the Danger Bay Section currently has the largest stock of herring in this district (Figure 3). This section opened with a 600-ton GHF for both purse seine (450-ton GHF) and gillnet (150-ton GHF) permit holders (Table 2). Purse seine fishermen harvested 431 tons and this section was not fished by gillnetters (Table 2). Commercial catch samples consisted of 6.0% age-4, 3.5% age-5, 69.2% age-6, 17.3 % age-7, and 2.0% age-8 herring (Table 4). Hydroacoustic surveys conducted by ADF&G observed 5,100 tons of herring prior to the fishery.

In 2011, the MacDonalds Lagoon, Kitoi Bay, and Izhut Bay sections were combined and managed as one unit allocated to purse seine gear with a 100-ton GHF (Table 2). Purse seine permit holders harvested 124 tons. Commercial catch samples consisted of 7.9% age 4, 67.5% age-6, 17.5% age-7, 4.0% age-8, and 1.6% age-10 herring (Table 4).

Uganik District

The Uganik District consists of nine sections on the northwest side of Kodiak Island (Figure 4). During the last 10 years this district had the largest harvests in the KMA. The 2011 GHF for the Village Islands/Uganik Bay sections was 1,700 tons (1,350 purse seine and 350 gillnet; table 2).

Purse seine fishermen harvested 1,561 tons and gillnet fishermen harvested 5 tons (Table 2). Catch samples were composed mainly of 1.2% age-3, 10.8% age-4, 8.4% age-5, 53.9% age-6, 18.8% age-7, 3.3% age-8, 1.8% age-9, and 1.5% age-10 herring (Table 4). The West Uganik Passage had a 50-ton GHL but no herring were harvested (Table 2).

Uyak District

The Uyak District is made of seven sections located on the west side of Kodiak Island (Figure 5). Through the 1980s, the Uyak District was the largest herring producing district in the KMA. In the early 1990s these stocks began declining and were at low levels for several years. In 2002, aerial surveys indicated that these stocks were improving, and by 2004 several sections were reopened for the first time since 1994. In 2011, the Inner Uyak Bay Section was combined with the Zachar Bay Section to be managed as one section. Herring are known to move between these two sections. The GHL for the Inner Uyak Bay/Zachar Bay sections was established at 300 tons (Table 2). However, due to low biomass estimates this section was never opened.

The Brown's Lagoon Section was open to gillnet gear in 2011 with an 80-ton GHL (Table 2). Gillnet fishermen harvested 15 tons (Table 2). Herring are known to stage in this section, then move into the Inner Uyak Section.

Alitak District

All sections in the Alitak District (Figure 6), except the Outer Alitak Section, are known to have herring stocks. Herring stocks began to decline in the early 1990s, and by 1998 most sections were closed. In 2002, aerial survey reports indicated an increase in herring abundance. In 2003 and 2004 some sections were opened to gillnet gear to act as test fisheries. By 2005, several sections that had been closed were reopened. In 2011 the combined GHL for sections in the Alitak District was one of the largest in the KMA; however, effort was light and few ADF&G surveys were conducted.

In 2011, the Inner and Outer Deadman Bay sections were combined and managed as one section. These combined sections had a GHL of 800 tons and purse seine fishermen harvested just 22 tons (Table 2).

The East Upper Olga Bay and West Upper Olga Bay sections were each open in 2011 with a 100-ton GHL. Purse seine fishermen harvested 35 tons from the East Upper Olga Bay Section and 7 tons from the West Upper Olga Bay Section (Table 2). Commercial catch samples from West Upper Olga Bay consisted of 2.7% age-3, 1.3% age-4, 2.7% age-5, 45.3% age-6, 26.7% age-7, 8.0% age-8, 9.3% age-9, 2.7% age-10, and 1.3% age-11 herring (Table 4).

Eastside District

The Eastside District is composed of four bay complexes: Ugak Bay, Kiliuda Bay, East Sitkalidak Strait, and West Sitkalidak Strait (Figure 7). Sixteen sections have been established and only one, the Outer Sitkalidak Section, has no history of herring sac roe harvests. Hydroacoustic surveys in this district are conducted less frequently than other portions of the KMA. Typically permit holders concentrate in sections of the Eastside District for the initial April 15 opening. However, the few permit holders began the season fishing elsewhere and the district wasn't fished until late April.

Generally, the East and West Sitkalidak sections have the earliest spawning herring in the KMA, with initial spawns sometimes occurring as early as late March. In 2011, the GHL for the East

Sitkalidak Section was established at 300 tons, and 62 tons were harvested by purse seine gear. The West Sitkalidak Section GHL was established at 300 tons in 2011, but it was not fished (Table 2).

The Barling Bay Section, adjacent to the West Sitkalidak Section, has been the most consistent herring producer in the Eastside District. For 2011 the GHL for this section was established at 150 tons but only 3 tons were harvested by purse seine gear (Table 2).

The GHL for the Outer Kiliuda Bay Section was set at 100 tons, and 75 tons were harvested by purse seine fishermen in 2011 (Table 2). Age compositions of the harvest were 7.0% age-4, 1.6% age-5, 78.0% age-6, 6.5% age-7, 3.4% age-8, 1.6% age-9, and 1.6% age-10 (Table 4). The Inner Kiliuda Bay Section was initially established as a gillnet section with a 50-ton GHL in 2011 (Table 2). In May, this section was also opened to the purse seine fleet, but no harvest occurred.

Ugak Bay has been a strong herring producer in the past. The 2011 GHL for the Outer Ugak Bay Section was 350 tons and allocated to purse seiners, 299 tons were harvested (Table 2). Samples from the harvest consisted mostly of 8.8% age-4, 2.4% age-5, 85.6% age-6, and 1.5% age-7 herring (Table 4). The Inner Ugak Bay Section was initially allocated to the gillnet fleet and opened to the purse seine fleet after April 30, but no harvest occurred.

The Shearwater Bay Section was initially allocated to the gillnet fleet with a 50-ton GHL (Table 2). After April 30, this section was opened to purse seiner gear and the purse seine fleet harvested 60 tons (Table 2). Age compositions from the harvest consisted primarily of 4.4% age-4, 1.5% age-5, 82.4% age-6, 4.4% age-7, 1.5% age-8, 3.7% age-9, and 2.2% age-10 herring (Table 4).

The Three Saints Bay Section had a GHL of 50 tons for purse seine gear, but no harvest occurred (Table 2). ADF&G conducted hydroacoustic surveys and estimated approximately 950 tons. Herring sampled by ADF&G were composed of 2.8% age-4, 3.4% age-5, 82.1% age-6, 5.6% age-7, 2.8% age-8, and 1.6% age-9 (Table 4).

The Newman Bay Section was open as exploratory and 9 tons were harvested by purse seiners (Table 2).

Northeast District

The Northeast District is composed of five sections, four of which have known spawning stocks of herring (Figure 8). The Women's Bay Section currently has the largest stock of herring in this district, and an aerial survey observed 90 tons. This section was initially opened to the gillnet fleet only with a 50-ton GHL (Table 2). On May 15, this section opened to purse seiners and they harvested 52 tons (Table 2). Samples from the harvest consisted of 4.5% age-4, 2.5% age-5, 76.0% age-6, 7.1% age-7, 6.3% age-8, and 3.0% age-9 herring (Table 4).

Inner Marmot District

There are five sections within the Inner Marmot District (Figure 9). All have known spawning stocks of herring, although most stocks are small. The Kizhuyak Bay Section has the largest stock of herring in the district. In 2011, this section was opened to purse seine gear with a 150-ton GHL and 198 tons were harvested (Table 2). Samples from the harvest were composed of 1.3% age-3, 10.6% age-4, 4.4% age-5, 70.8% age-6, 10.6% age-7, and 1.3% age-8 herring (Table 4).

Mainland District

There are three Mainland districts comprising 12 sections (Figure 10). The last commercial herring harvest from the Mainland districts occurred in 1997. Seven sections were open as exploratory in 2011; however, no effort occurred. The Inner Kukak Bay Section currently has the largest known biomass in the Mainland districts. Over 30,000 tons were estimated in this section based on hydroacoustic surveys in 2011. Samples from this biomass were composed of 2.1% age-2, 23.4% age-3, 67.5% age-4, 2.9% age-5, and 3.1% age-6 herring (Table 4).

HERRING FOOD AND BAIT FISHERY

FISHERY CHARACTERISTICS

Harvest Strategy

The herring food and bait season currently opens September 1 and lasts until February 28 (5 AAC 27.510(b)). GHs for the fishery are established by district and are based upon 10% of the GHs established for the preceding sac roe fishery by section (5 AAC 27.535(b)).

Combine Fisheries

The KMA herring food and bait fishery was closed for the 1999 and 2000 seasons because of low potential GHs and ADF&G's concern for manageability of a competitive fishery on a highly aggregated stock. In 2001, the Commercial Fisheries Entry Commission (CFEC) designated the KMA herring food and bait fishery a limited entry fishery and issued 13 interim use permits to those fishermen who made landings between 1994 and 1998 (Gretsch 2001). Because of the relatively low GHs available (60 tons in the Uganik District and 47 tons in the Eastside District), ADF&G did not allow a competitive fishery in 2001. As an alternative, the interim permit holders formed a combine, and ADF&G and CFEC agreed to allow a combine fishery to occur. The 13 interim permit holders determined which vessel would conduct the harvest, all marketing aspects, and all costs associated with harvesting and tendering the herring. In July 2002, the CFEC made a final determination on these limited entry permits. Nine permanent limited entry permits were issued, consisting of five purse seine/gillnet permits and four trawl permits.

Combine fisheries have been conducted under similar conditions each season from 2002 through 2010. Generally, one purse seine vessel is used to harvest herring that are then loaded onto a tender for transport. Fishing efforts have been focused mainly on Uganik, the area with the largest GH. Areas with smaller GHs, such as the Eastside, Alitak, and Uyak districts, have generally seen less effort. Only purse seine vessels have been used to harvest herring for the combine.

Kamishak Stock

During the fall and winter months of the early 1980s, large concentrations of herring were observed in eastern Shelikof Strait and adjacent bays along the west side of the Kodiak Archipelago. The biomass exceeded that of known KMA spawning stocks. Herring food and bait fishermen targeted these herring, but the stock composition was unknown. In 1986, a stock identification study, based on scale pattern analysis, was conducted on herring harvested from a large biomass located in the northeastern part of the Shelikof Strait (Johnson et al., *Unpublished*, Stock Identification of Pacific Herring in the Bait Fishery in Shelikof Strait, Alaska, 1985/86,

available through Geoff Spalinger, ADF&G fishery management biologist, Kodiak, Alaska). Results of the study indicated that at least 80% of the Shelikof herring catch sampled were Kamishak Bay stocks, which spawn within the Lower Cook Inlet (LCI) Management Area. The current harvest strategy alleviates the problem of identifying the spawning stock of a harvest in areas where intermixing may occur by closing the food and bait fishery north of the latitude of Miners Point (Uganik Bay) when the Kamishak spawning biomass falls below 6,000 tons (5 AAC 27.535(d)).

KAMISHAK FISHERY CLOSURE

The 2012 biomass forecast for Kamishak Bay herring affects the 2011/2012 Kodiak food and bait fishery in the Shelikof Strait. The biomass forecast for Kamishak Bay herring for the 2012 season was estimated at 3,471 tons, well below the minimum spawning biomass of 6,000 tons that must be met before commercial fisheries may occur ((5 AAC 27.465(e)(4)); Ted Otis, Lower Cook Inlet Finfish Research Biologist, ADF&G, Homer, Alaska, *Personal Communication*). This was the twelfth consecutive year that the Kamishak Bay District sac roe fishery has been closed. Due to the 2012 Kamishak Bay sac roe fishery closure, the Shelikof Strait food and bait fishery north of the latitude of Miner's Point (Figure 4) was closed for the 2011/2012 season.

2011/2012 SEASON

Permit holders again requested a combine fishery for the 2011/2012 season, although there was some discussion of having a competitive fishery. The biggest obstacle to a competitive fishery is how to determine an equitable fishing period for the two gear types. ADF&G accommodated the permit holders' request, and the South Afognak District (70-ton GHL) and the Uganik District (180-ton GHL) south of the latitude of Miner's Point opened on October 11 (Table 6). Approximately 62 tons were harvested from the South Afognak District on October 12 and 23 more were taken on October 14. The South Afognak District closed on October 14. From October 16 through October 18 approximately 127 tons were harvested from the Uganik District. The Uganik District remained open to the end of the season as there was no additional effort. The Eastside District (155-ton GHL) could have been opened if there were any interest in fishing these areas (Table 6). A total of 212 tons were harvested from the 405 ton GHL during the 2011/2012 season (Table 7).

HERRING SUBSISTENCE FISHERY

FISHERY CHARACTERISTICS

Prior to 1999, the herring subsistence fishery was referred to as a Personal Use/Subsistence Fishery and had occurred for at least twenty years. The majority of the harvest occurred near the Port of Kodiak in Womens Bay and was caught by gillnets. The herring were used primarily for bait in commercial longline and pot fisheries. Also, prior to 1999, this fishery was only regulated during the herring sac roe season, from April 15 to June 30, under the conditions of the subsistence permit issued in Kodiak. Gear was limited to a 25-fathom gillnet but there was no harvest limit. The remainder of the year there were no permit requirements, gear restrictions, or harvest limits.

In 1999, more restrictive regulations were approved by the BOF. These regulations allowed for a harvest of up to 500 pounds of herring with no permit requirements, except during the sac roe fishing season (April 15 to June 30; Gretsche 2001). A subsistence permit was required for those

individuals that wished to fish during the sac roe season or intended to harvest more than 500 pounds of herring annually. The maximum annual harvest was limited to 2,000 pounds per permit.

In 2000, herring subsistence harvests escalated due to bait needs created with the reopening of the commercial tanner crab fishery in the KMA. The department was concerned about the increased herring subsistence harvest and the appropriateness of taking subsistence herring for use as bait in a commercial fishery. ADF&G proposed regulation changes to the BOF in 2001, which were approved to allow for both types of historic harvests. The current subsistence regulation allows for the harvest of up to a total of 500 pounds of herring annually and requires that fishermen obtain a permit prior to fishing (5 AAC 01.530. (d)). Herring were included on the existing KMA salmon and crab subsistence permit. Another permit was also created which allows for the harvest of up to 1,000 pounds of herring by commercial permit holders to be used as bait in commercial fisheries (5 AAC 27.545).

2011 SEASON SUMMARY

A total of 8 KMA subsistence permits were returned to ADF&G, as required for reporting purposes, with herring subsistence harvest data. The reported subsistence herring harvests totaled 360 pounds (Table 8). The majority of the harvest occurred in the Inner Marmot and Northeast districts.

REFERENCES CITED

- Gretsch, D. 2001. Kodiak management area annual herring management report, 1999. Alaska Department of Fish and Game, Division of Commercial Fisheries, Regional Information Report 4K01-28.
- Hjellvik V., N. O. Handegard., and E. Ona. 2008. Correcting for vessel avoidance in acoustic-abundance estimates for herring. ICES Journal of Marine Science, 65; 1036-1045.

TABLES AND FIGURES

Table 1.–Annual harvests by weight and percent in the KMA commercial herring sac roe and food and bait fisheries, from 1964 through 2011.

Year	Sac Roe Harvest (Tons)	Food/Bait Harvest (Tons)	Total Herring Harvest (Tons)	Sac Roe Fishery Percent of Total Harvest (%)	Food/Bait Fishery Percent of Total Harvest (%)
1964	568	310	878	65%	35%
1965	657	35	692	95%	5%
1966	2,769	198	2,967	93%	7%
1967	1,662	300	1,962	85%	15%
1968	2,001	15	2,016	99%	1%
1969	1,130	11	1,141	99%	1%
1970	342	8	350	98%	2%
1971	284	44	328	87%	13%
1972	215	50	265	81%	19%
1973	831	178	1,009	82%	18%
1974	868	40	908	96%	4%
1975	8	5	13	62%	38%
1976	5	0	5	100%	0%
1977	338	0	338	100%	0%
1978	904	399	1,303	69%	31%
1979	1,735	125	1,860	93%	7%
1980	2,383	381	2,764	86%	14%
1981	2,065	18	2,083	99%	1%
1982	1,771	326	2,097	84%	16%
1983	2,318	33	2,351	99%	1%
1984	2,163	123	2,286	95%	5%
1985	1,968	102	2,070	95%	5%
1986	1,558	213	1,771	88%	12%
1987	2,146	217	2,363	91%	9%
1988	2,171	340	2,511	86%	14%
1989	2,249	345	2,594	87%	13%
1990	2,347	313	2,660	88%	12%
1991	2,432	215	2,647	92%	8%
1992	4,283	312	4,595	93%	7%
1993	4,929	837	5,766	85%	15%
1994	5,893	677	6,570	90%	10%
1995	4,604	507	5,111	90%	10%
1996	3,386	651	4,037	84%	16%
1997	3,235	756	3,991	81%	19%
1998	2,057	151	2,208	93%	7%
1999	1,651	0	1,651	100%	0%
2000	1,370	0	1,370	100%	0%
2001	1,694	115	1,809	94%	6%
2002	1,677	135	1,812	93%	7%
2003	1,992	199	2,191	91%	9%
2004	3,167	190	3,357	94%	6%
2005	3,463	168	3,631	95%	5%
2006	2,643	169	2,812	94%	6%
2007	2,546	154	2,700	94%	6%
2008	3,099	202	3,301	94%	6%
2009	4,759	263	5,022	95%	5%
2010	5,701	191	5,892	97%	3%
2011	2,957	212	3,169	93%	7%
Average					
1964 to 2011	2,187	213	2,401	91%	9%
10 Year Average					
2002 to 2011	3,200	188	3,389	94%	6%
5 Year Average					
2007 to 2011	3,812	204	4,017	95%	5%

Table 2.—Herring sac roe fishery guideline harvest level (GHL) by section and gear type, harvest by section and gear type, and date sections were closed, Kodiak Management Area, 2011.

Statistical Area	Management Section	GHL	Initial Gear Type ^a	Harvest		Date Closed	
				Purse Seine	Gillnet	Purse Seine	Gillnet
NORTH AFOGNAK DISTRICT							
NA10	Shuyak Island	CLOSED	-	-	-	-	-
NA20	Delphin Bay	EXPLORATORY	Both	0	0	6/30/2011	6/30/2011
NA30	Perenosa Bay	10	Gillnet	-	0	-	6/30/2011
NA40	Seal Bay	CLOSED	-	-	-	-	-
NA50	Tonki Bay	40	Purse Seine	0	-	6/30/2011	6/30/2011
WEST AFOGNAK DISTRICT							
WA10	Raspberry Strait	10	Gillnet	-	0	-	6/30/2011
WA20	Malina Bay	10	Gillnet	-	0	-	6/30/2011
WA31 ^b	Paramanof Bay	CLOSED	-	-	-	-	-
WA32 ^b	Foul Bay	CLOSED	-	b	b	b	b
WA40	Bluefox Bay	EXPLORATORY	Both	0	0	6/30/2011	6/30/2011
WA50	Offshore W. Afognak	CLOSED	-	-	-	-	-
SOUTH AFOGNAK DISTRICT							
SA10 ^c	Izhut Bay	100	Purse Seine	124	-	4/27/2011	-
SA20 ^c	Kitoi Bay	c	c	c	c	c	c
SA30 ^c	MacDonald Lagoon	c	c	c	c	c	c
SA40	Danger Bay	600	450PS/150GN	431	0	4/17/2011	5/8/2011
SA50	Litnik	CLOSED	-	-	-	-	-
SA60	Duck Bay	CLOSED	-	-	-	-	-
TOTAL ALL AFOGNAK DISTRICTS				555	0		
UGANIK DISTRICT							
UG10	Kupreanof	CLOSED	-	-	-	-	-
UG20	Viekoda Bay	25	Gillnet	-	0	6/30/2011	6/30/2011
UG21	Terror Bay	30	Gillnet	0	0	6/30/2011	6/30/2011
UG30 ^d	Village Islands	1,700	1,350PS/350GN	1,561	5	4/22/2011	5/2/2011
UG31	West Uganik Passage	50	Gillnet	0	0	6/30/2011	6/30/2011
UG32 ^d	NE Arm Uganik Bay	d	d	d	d	d	d
UG33 ^d	East Arm Uganik Bay	d	d	d	d	d	d
UG34 ^d	South Arm Uganik Bay	d	d	d	d	d	d
UG40	Offshore Uganik	CLOSED	-	-	-	-	-
DISTRICT TOTAL		1,805		1,561	5		
UYAK DISTRICT							
UY10	Offshore Uyak	CLOSED	-	-	-	-	-
UY20	Harvester Island	CLOSED	-	-	-	-	-
UY30 ^e	Inner Uyak	300	Purse Seine	-	-	-	-
UY32	Browns Lagoon	80	Gillnet	-	15	-	6/30/2011
UY31	Larsen Bay	CLOSED	-	-	-	-	-
UY40 ^e	Zachar Bay	e	e	e	e	e	e
UY50	Spiridon Bay	10	Gillnet	-	0	-	6/30/2011
DISTRICT TOTAL		390		0	15		
ALITAK DISTRICT							
AL10	Outer Alitak	CLOSED	-	-	-	-	-
AL20	Inner Alitak	200	Gillnet	0	0	6/30/2011	6/30/2011
AL21 ^f	Inner Deadman Bay	800	Purse Seine	22	0	6/30/2011	6/30/2011
AL22 ^f	Outer Deadman Bay	f	f	f	f	f	f
AL30	Sulua Bay	100	Gillnet	0	0	6/30/2011	6/30/2011
AL40	Lower Olga	75	Gillnet	0	0	6/30/2011	6/30/2011
AL41	East Upper Olga Bay	100	Purse Seine	35	0	6/30/2011	6/30/2011
AL50	West Upper Olga Bay	100	Purse Seine	7	0	6/30/2011	6/30/2011
AL60	Geese/Twoheaded	EXPLORATORY	Both	0	0	6/30/2011	6/30/2011
DISTRICT TOTAL		1,375		64	0		
STURGEON/HALIBUT DISTRICT							
SH10	Sturgeon/Halibut	CLOSED	CLOSED	CLOSED			

-continued-

Table 2.–Page 2 of 2

Statistical Area	Management Section	GHL	Initial Gear Type ^a	Harvest		Date Closed	
				Purse Seine	Gillnet	Purse Seine	Gillnet
EASTSIDE DISTRICT							
EA10	Kaiugnak	EXPLORATORY	Both	0	0	-	-
EA20	SW. Sitkalidak	EXPLORATORY	Both	0	0	6/30/2011	6/30/2011
EA21	Three Saints Bay	50	Purse Seine	0	0	6/30/2011	6/30/2011
EA22	Newman Bay	EXPLORATORY	Both	9	0	5/2/2011	5/2/2011
EA23	W. Sitkalidak Strait	300	Purse Seine	0	-	6/30/2011	6/30/2011
EA24	Barling Bay	150	Gillnet	3	0	6/30/2011	6/30/2011
EA30	E. Sitkalidak Strait	300	Purse Seine	62	-	6/30/2011	6/30/2011
EA31	Tanginak Anchorage	EXPLORATORY	Both	0	0	6/30/2011	6/30/2011
EA40	Outer Sitkalidak	CLOSED	-	-	-	-	-
EA41	Boulder Bay	CLOSED	-	-	-	-	-
EA42	Shearwater Bay	50	Gillnet	60	0	5/8/2011	5/8/2011
EA43	Outer Kiliuda Bay	100	Purse Seine	75	-	4/27/2011	-
EA44	Inner Kiliuda Bay	50	Gillnet	0	0	6/30/2011	6/30/2011
EA50	Outer Ugak Bay	350	Purse Seine	299	-	4/26/2011	-
EA51	Inner Ugak Bay	200	Gillnet	0	0	6/30/2011	6/30/2011
EA52	Pasagshak Bay	CLOSED	-	-	-	-	-
DISTRICT TOTAL		1,550		508	0		
NORTHEAST DISTRICT							
NE10	Womens Bay	50	Gillnet	52	0	5/15/2011	5/15/2011
NE20	Kalsin Bay	CLOSED	-	-	-	-	-
NE30	Middle Bay	CLOSED	-	-	-	-	-
NE40	Inshore Chiniak	CLOSED	-	-	-	-	-
NE50	Offshore Chiniak	CLOSED	-	-	-	-	-
DISTRICT TOTAL		50		52	0		
INNER MARMOT DISTRICT							
IM10	Monashka Bay	CLOSED	-	-	-	-	-
IM20	Anton Larsen Bay	15	Gillnet	-	0	-	6/30/2011
IM30	Sharatin Bay	30	Gillnet	-	0	-	6/30/2011
IM40	Kizhuyak Bay	150	Purse Seine	198	-	4/24/2011	-
IM50	Spruce Island	CLOSED	-	-	-	-	-
DISTRICT TOTAL		195		198	0		
NORTH MAINLAND DISTRICT							
NM10	Hallo Bay	CLOSED	-	-	-	-	-
NM20	Inner Kukak	EXPLORATORY	Both	0	0	6/30/2011	6/30/2011
NM30	Outer Kukak	CLOSED	-	-	-	-	-
NM40	Missak Bay	CLOSED	-	-	-	-	-
MID MAINLAND DISTRICT							
MM10	Inner Katmai	EXPLORATORY	Both	0	0	6/30/2011	6/30/2011
MM20	Outer Katmai	CLOSED	-	-	-	-	-
MM30	Alinchak	EXPLORATORY	Both	0	0	6/30/2011	6/30/2011
MM40	Puale Bay	EXPLORATORY	Both	0	0	6/30/2011	6/30/2011
MM50	Portage Bay	EXPLORATORY	Both	0	0	6/30/2011	6/30/2011
MM60	Outer Portage	CLOSED	-	-	-	-	-
SOUTH MAINLAND DISTRICT							
SM10	Wide Bay	EXPLORATORY	Both	0	0	6/30/2011	6/30/2011
SM20	Lower Shelikof	CLOSED	-	-	-	-	-
MAINLAND DISTRICTS TOTAL				0	0		
GRAND TOTAL		6,135		2,937	20		
				% of Harvest	% of Harvest	Total Harvest	
				99%	1%	2,957	

^a Beginning May 1, ADF&G may open any area to any gear group.

^b WA31 and WA32 were combined and managed as one section.

^c SA10, SA20, and SA30 were combined and managed as one section.

^d UG30, UG32, UG33, and UG 34 were combined and managed as one section.

^e UY30 and UY40 were combined and managed as one section.

^f AL21 and AL22 were combined and managed as one section.

Table 3.—Summary of season length, guideline harvest level (GHL), harvest by gear type, percentage of harvest by gear type, number of landings, and estimated exvessel earnings for the herring sac roe fishery in the KMA, from 1979 through 2011.

Year	Season Length (Days)	GHL (Tons)	Total Harvest (Tons)	Harvest		Percent Harvest by Gear Type		Number of		Units of Gear Fished		Average Catch by		Estimated Average		Price per Ton ^a	Estimated Exvessel Total Value ^a
				by Gear Type				Landings by Gear				Gear		Earnings ^a			
				Seine (Tons)	Gillnet (Tons)	Seine	Gillnet	Seine	Gillnet	Seine (Tons)	Gillnet (Tons)	Seine (\$)	Gillnet (\$)				
1979	36	2,400	1,735	1,457	278	84%	16%	-	-	57	125	26	2	\$38,342	\$3,336	\$1,500	\$2,602,500
1980	35	2,400	2,383	2,009	374	84%	16%	-	-	92	109	22	3	\$15,068	\$2,368	\$690	\$1,644,270
1981	48	2,400	2,065	1,596	469	77%	23%	207	406	79	114	20	4	\$14,647	\$2,983	\$725	\$1,497,125
1982	59	2,400	1,771	1,447	324	82%	18%	138	191	45	67	32	5	\$17,686	\$2,660	\$550	\$974,050
1983	51	2,400	2,319	1,797	522	77%	23%	164	284	41	64	44	8	\$35,063	\$6,525	\$800	\$1,855,200
1984	54	2,400	2,163	1,691	472	78%	22%	138	212	39	69	43	7	\$34,687	\$5,472	\$800	\$1,730,400
1985	59	2,000	1,968	1,244	724	63%	37%	118	348	34	81	37	9	\$32,929	\$8,044	\$900	\$1,771,200
1986	61	1,690	1,558	1,110	448	71%	29%	132	385	31	71	36	6	\$34,016	\$5,994	\$950	\$1,480,100
1987	61	1,640	2,146	1,591	554	74%	26%	122	411	29	62	55	9	\$54,862	\$8,935	\$1,000	\$2,146,000
1988	59	2,065	2,171	1,304	867	60%	40%	169	555	33	76	40	11	\$51,370	\$14,830	\$1,300	\$2,822,300
1989	76	2,415	2,249	1,513	736	67%	33%	171	627	37	83	41	9	\$34,758	\$7,537	\$850	\$1,911,650
1990	75	2,375	2,347	1,644	703	70%	30%	156	544	27	63	61	11	\$51,756	\$9,485	\$850	\$1,994,950
1991	83	2,510	2,432	1,697	735	70%	30%	169	587	32	64	53	11	\$45,077	\$9,762	\$850	\$2,067,200
1992	77	2,720	4,283	3,260	1,023	76%	24%	185	706	40	74	82	14	\$40,750	\$6,912	\$500	\$2,141,500
1993	77	3,525	4,929	4,203	726	85%	15%	237	294	41	86	103	8	\$56,382	\$4,643	\$550	\$2,710,950
1994	71	4,550	5,893	4,976	917	84%	16%	285	485	66	57	75	16	\$60,315	\$12,870	\$800	\$4,714,400
1995	73	4,480	4,604	3,837	768	83%	17%	280	642	73	71	53	11	\$66,858	\$13,759	\$1,272	\$5,856,288
1996	69	4,180	3,386	2,322	1,064	69%	31%	202	890	57	74	41	14	\$81,474	\$28,757	\$2,000	\$6,772,000
1997	49	3,435	3,235	2,629	606	81%	19%	183	418	64	59	41	10	\$20,539	\$5,136	\$500	\$1,617,500
1998	50	2,030	2,057	1,954	103	95%	5%	110	26	35	7	56	15	\$27,914	\$7,357	\$500	\$1,028,500
1999	38	1,495	1,651	1,589	62	96%	4%	94	16	31	5	51	12	\$33,984	\$8,221	\$663	\$1,094,613
2000 ^b	37	1,735	1,370	1,290	80	94%	6%	57	23	31	10	42	8	\$29,129	\$5,600	\$700	\$959,000
2001	47	1,540	1,694	1,412	282	83%	17%	67	37	33	9	43	31	\$21,394	\$15,667	\$500	\$847,000
2002	46	1,860	1,677	1,274	403	76%	24%	37	50	30	14	42	29	\$21,233	\$14,393	\$500	\$838,500
2003	42	2,600	1,992	1,738	254	87%	13%	59	45	31	11	56	23	\$28,032	\$11,545	\$500	\$996,000
2004	42	2,850	3,167	2,894	273	91%	9%	95	36	27	11	107	25	\$53,593	\$12,409	\$500	\$1,583,500
2005	37	3,475	3,463	2,932	531	85%	15%	134	61	32	12	92	44	\$45,813	\$22,125	\$500	\$1,731,500
2006	34	3,705	2,643	2,617	26	99%	1%	86	^c	21	^c	125	^c	\$34,270	^c	\$275	\$726,825

-continued-

Table 3.–Page 2 of 2

Year	Season Length (Days)	GHL (Tons)	Total Harvest (Tons)	Harvest by Gear Type		Percent Harvest by Gear Type		Number of Landings by Gear Type		Units of Gear Fished		Average Catch by Gear		Estimated Average Earnings ^a		Price per Ton ^a	Estimated Exvessel Total Value ^a
				Seine	Gillnet	Seine	Gillnet	Seine	Gillnet	Seine	Gillnet	Seine	Gillnet	Seine	Gillnet		
				(Tons)	(Tons)							(Tons)	(Tons)	(\$)	(\$)	(\$)	(\$)
2007	37	4,000	2,546	2,510	36	99%	1%	105	8	21	3	120	12	\$47,810	\$4,800	\$400	\$1,018,400
2008	38	4,290	3,099	3,086	13	99.6%	0.4%	108	^c	22	^c	140	^c	\$73,643	^c	\$525	\$1,626,975
2009	54	4,765	4,759	4,549	210	96%	4%	218	19	31	6	147	35	\$77,040	\$18,375	\$525	\$2,498,475
2010	48	6,075	5,701	5,538	163	97%	3%	277	14	36	7	154	23	\$61,533	\$9,314	\$400	\$2,280,400
2011	48	6,135	2,957	2,937	20	99%	1%	95	6	14	3	210	7	\$41,957	\$1,333	\$200	\$591,400
Average																	
1979 to 2011	54	2,986	2,800	2,353	447	83%	17%	148	269	40	48	69	14	\$41,937	\$9,138	\$730	\$2,003,960
10 Year																	
2002 to 2011	43	3,976	3,200	3,008	193	93%	7%	121	24	27	7	119	22	\$48,492	\$10,470	\$433	\$1,389,198
5 Year																	
2007 to 2011	45	5,053	3,812	3,724	88	98%	2%	161	10	25	4	154	18	\$60,397	\$8,130	\$410	\$1,603,130

^a Exvessel values are based on dock delivered herring and inseason data.

^b Beginning in 2000, an allocative harvest strategy was in effect.

^c Confidential.

Table 4.–Age composition of herring samples from the commercial sac roe fishery, by section in the KMA, 2011.

Section	n	Percent at Age											Harvest (tons)
		Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12	
Browns Lagoon	77	0.0	0.0	3.9	3.9	64.9	16.9	5.2	3.9	1.3	0.0	0.0	15
Danger Bay	451	0.0	0.7	6.0	3.5	69.2	17.3	2.0	0.4	0.4	0.4	0.0	431
Inner Kukak	381	2.1	23.4	67.5	2.9	3.1	0.8	0.0	0.3	0.0	0.0	0.0	0
Kitoi/Izhut/MacDonalds	126	0.0	0.0	7.9	0.8	67.5	17.5	4.0	0.8	1.6	0.0	0.0	124
Kizhuyak	226	0.0	1.3	10.6	4.4	70.8	10.6	1.3	0.9	0.0	0.0	0.0	198
Outer Kiliuda	387	0.0	0.3	7.0	1.6	78.0	6.5	3.4	1.6	1.6	0.3	0.0	75
Outer Ugak	680	0.0	0.3	8.8	2.4	85.6	1.5	0.3	0.9	0.3	0.0	0.0	299
Shearwater	136	0.0	0.0	4.4	1.5	82.4	4.4	1.5	3.7	2.2	0.0	0.0	60
Three Saints Bay	319	0.0	0.6	2.8	3.4	82.1	5.6	2.8	1.6	0.3	0.3	0.3	0
Village Islands/Uganik Bays	896	0.0	1.2	10.8	8.4	53.9	18.8	3.3	1.8	1.5	0.2	0.1	1,566
West Upper Olga	75	0.0	2.7	1.3	2.7	45.3	26.7	8.0	9.3	2.7	1.3	0.0	7
Womens Bay	396	0.0	0.3	4.5	2.5	76.0	7.1	6.3	3.0	0.3	0.0	0.0	52
All Samples Combined ^a	4,150	0.0	0.9	9.3	5.9	63.0	15.2	2.7	1.5	1.1	0.2	0.1	2,826

^a For 'All samples combined' the percent of the harvest by section is weighted to the age class data to estimate overall age composition of the harvest.

Table 5.–Average weight of herring samples from the commercial sac roe fishery, by age and section in the KMA, 2011.

Section	n	Weight at Age (g)										
		Age-2	Age-3	Age-4	Age-5	Age-6	Age-7	Age-8	Age-9	Age-10	Age-11	Age-12
Browns Lagoon	77	-	-	163	167	202	233	258	241	253	-	-
Danger Bay	451	-	92	118	164	181	213	233	267	302	324	-
Inner Kukak	381	32	59	82	120	139	151	0	162	-	-	-
Kitoi/Izhut/MacDonalds	126	-	0	132	193	190	214	251	355	314	-	-
Kizhuyak	226	-	93	107	158	175	218	246	258	-	-	-
Outer Kiliuda	397	-	97	117	158	191	224	242	276	269	332	-
Outer Ugak	680	-	100	113	152	183	228	289	260	261	-	-
Shearwater	136	-	0	112	153	194	225	246	283	287	-	-
Three Saints Bay	319	-	99	128	154	190	222	246	244	304	255	303
Village Islands/Uganik Bays	896	-	106	123	159	190	219	240	261	272	274	298
West Upper Olga	75	-	138	214	282	238	266	313	322	307	353	-
Womens Bay	396	-	54	126	155	185	231	254	250	320	-	-

Table 6.–Herring food and bait commercial fishery GHLS and harvest (tons) by district, KMA, 2011.

Management District	GHLS	Harvest
F/B 3 - South Afognak	70	85
F/B 4 - Uganik	180	127
F/B 8 - Eastside	155	0
Total	405	212

Table 7.–Herring food and bait commercial fishery GHLS and harvest, KMA, 2001 through 2011.

Year	GHLS (tons)	Harvest (tons)
2001	107	114
2002	134	135
2003	197	199
2004	225	190
2005	302	168
2006	342	169
2007	370	154
2008	351	202
2009	420	263
2010	555	191
2011	405	212
Average	310	182

Table 8.—Subsistence herring harvest summary for the KMA, 1991 through 2011.

Year	Permits		Estimated Harvest in Pounds by District								
	Issued	Returned	Afognak	Northeast	Inner Marmot	Uganik	Uyak	Eastside	Alitak	Other	Total
1991	50	9	2,110	1,745	1,745	1,000	0	0	0	0	6,600
1992	45	10	120	250	250	1,000	0	0	320	0	1,940
1993	50	16	90	3,000	3,910	550	50	0	0	0	7,600
1994	47	14	90	740	1,350	2,000	200	0	0	0	4,380
1995	20	6	75	0	500	0	340	0	175	0	1,090
1996	23	10	550	180	140	0	590	0	0	0	1,460
1997	16	7	0	200	350	50	1,325	0	0	0	1,925
1998	18	10	1,240	0	0	50	0	0	0	0	1,290
1999	15	9	0	200	350	0	425	0	0	0	975
2000	39	21	575	21,150	0	1,825	0	0	700	0	24,250
2001	48	19	3,000	0	875	0	1,015	10,500	0	0	15,390
2002	^a	23	1,170	1,150	420	0	200	903	0	0	3,843
2003	^a	16	0	220	300	0	420	1,210	30	0	2,180
2004	^a	24	200	580	465	206	1,580	1,142	0	0	4,173
2005	^a	37	300	850	1,070	160	550	2,300	155	0	5,385
2006	^a	33	600	1,109	1,175	250	415	1,650	0	0	5,199
2007	^a	37	200	912	1,430	5	1,470	850	300	0	5,167
2008	^a	21	100	1,134	1,110	50	1,020	610	0	0	4,024
2009	^a	36	625	660	520	400	451	980	0	330	3,966
2010	^a	26	401	527	650	200	250	595	150	0	2,773
2011	^a	8	0	145	200	0	10	5	0	0	360

^a Beginning in 2002 herring was added to the Kodiak subsistence salmon and crab permit; no separate permit was required.

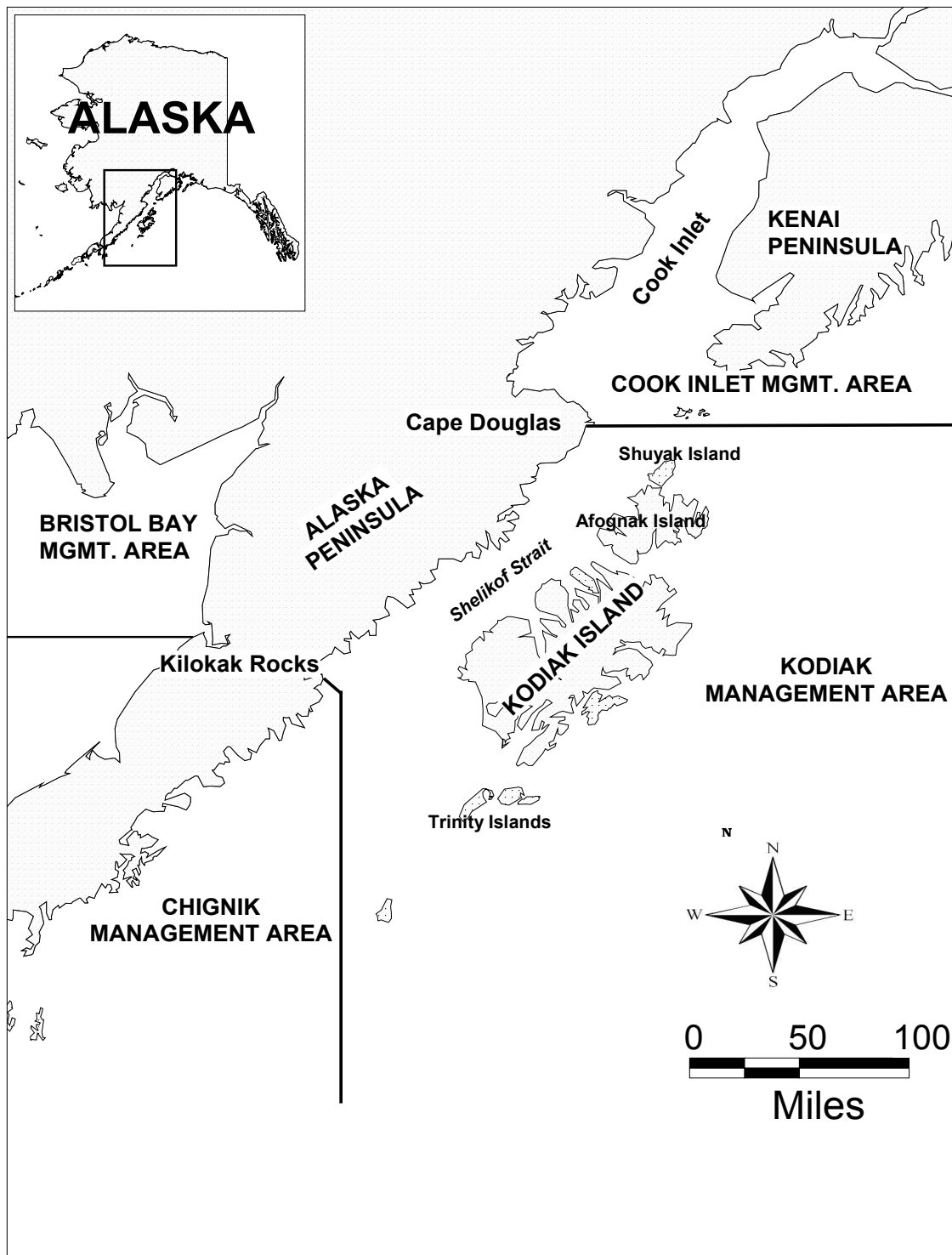


Figure 1.—Map of southwestern Alaska showing the KMA and surrounding management areas.

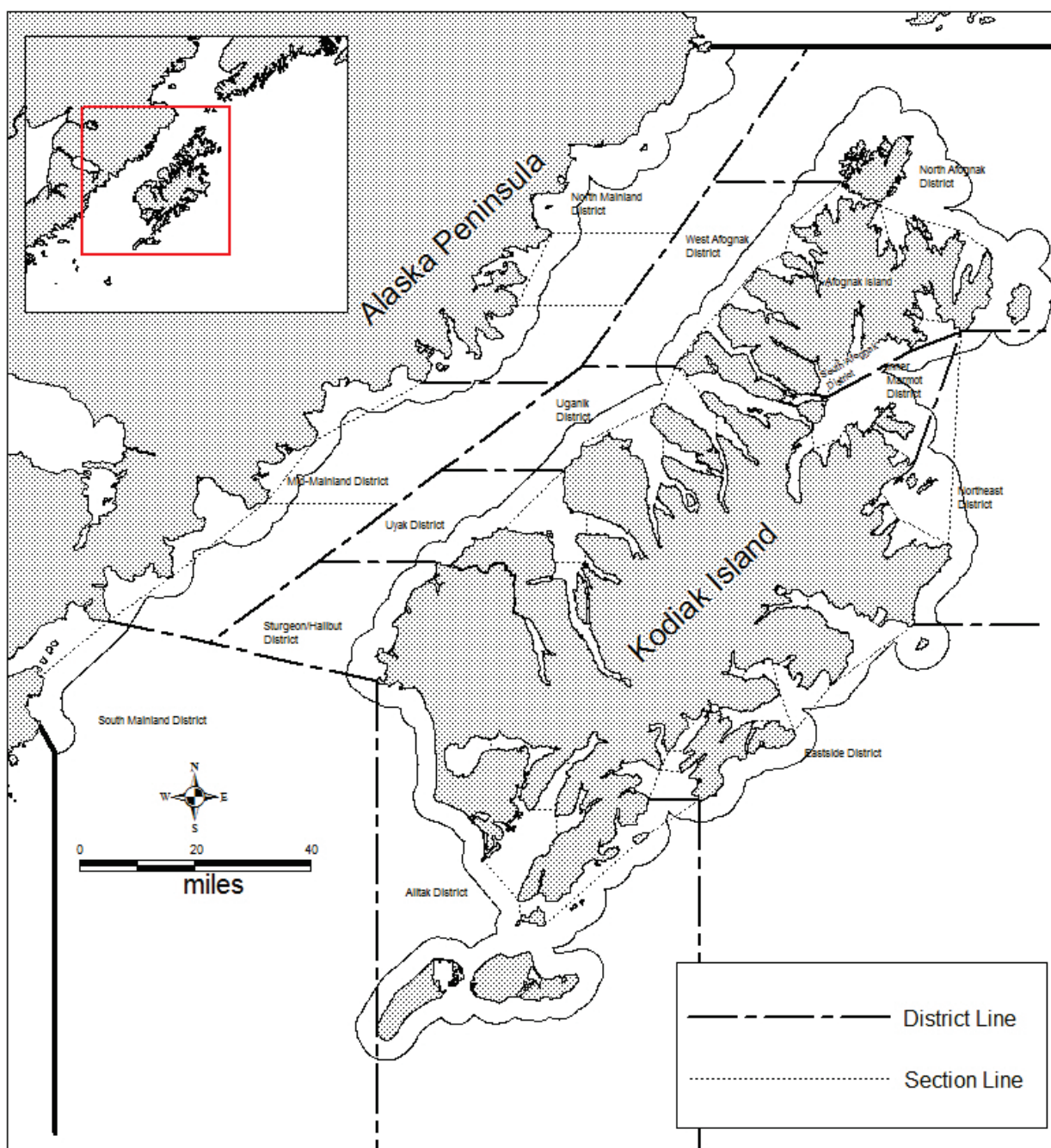


Figure 2.—Map of the KMA illustrating the herring commercial fishery districts.

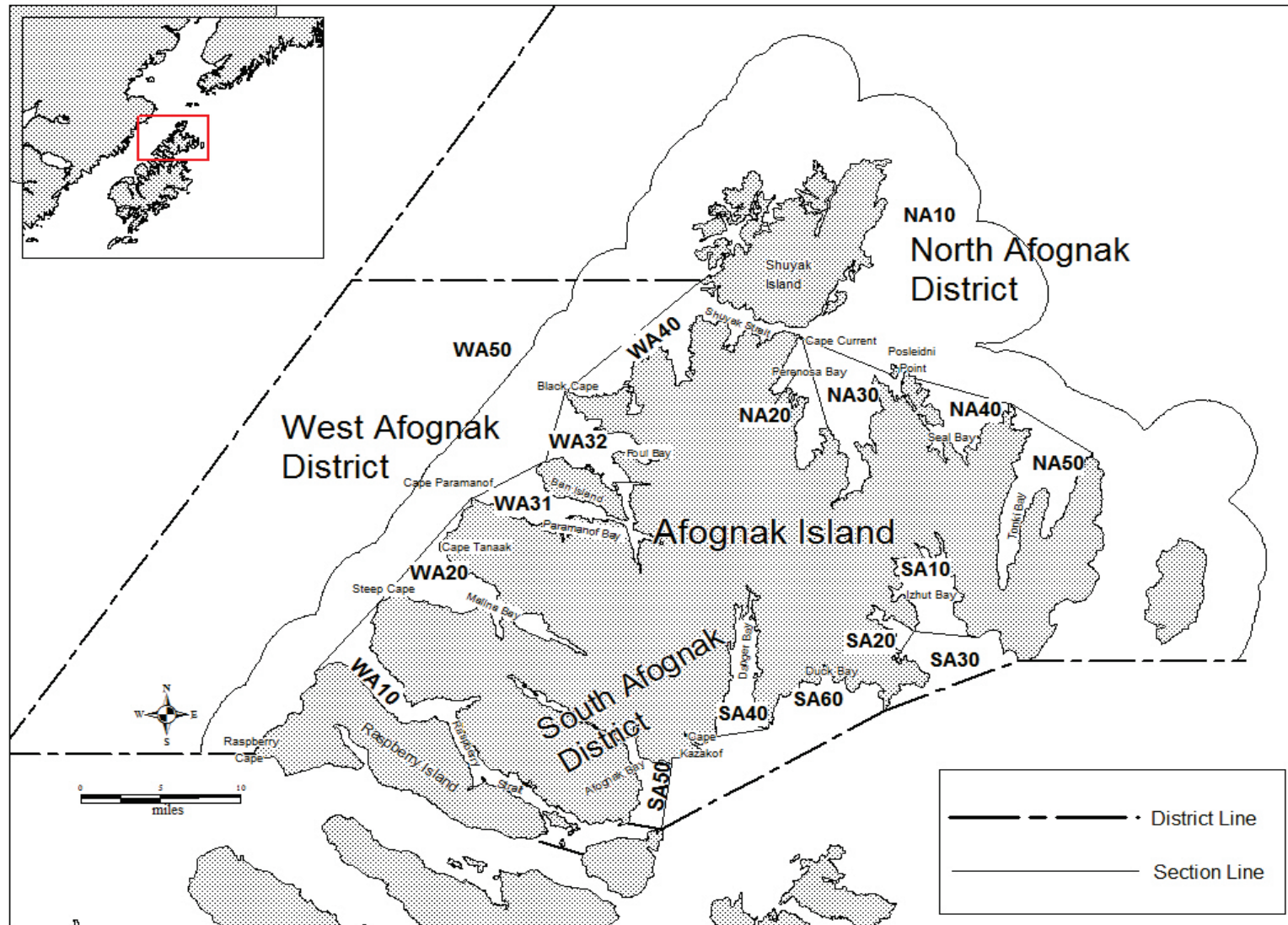


Figure 3.—Map showing the Afognak districts.

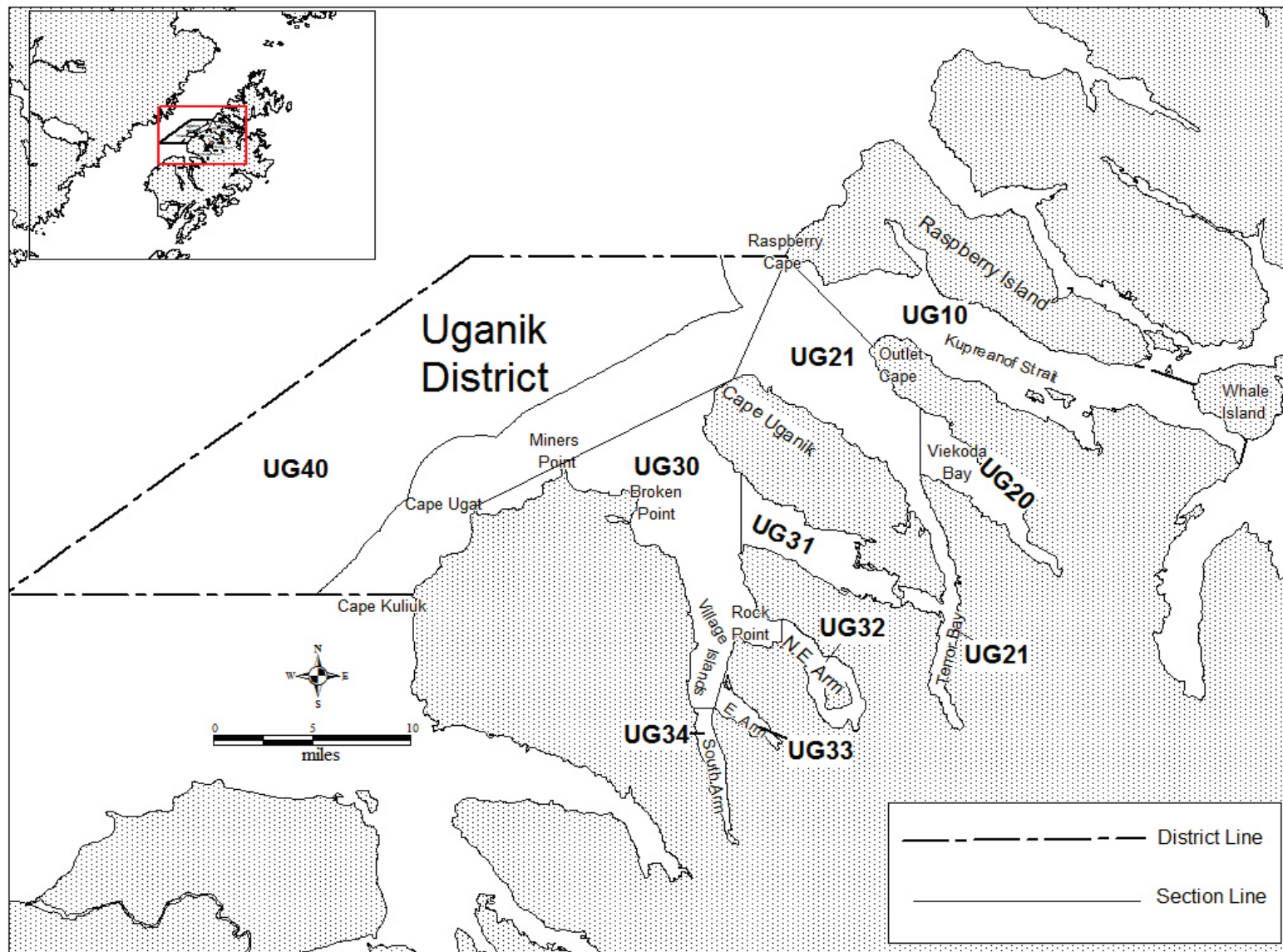


Figure 4.—Map showing the Uganik District.

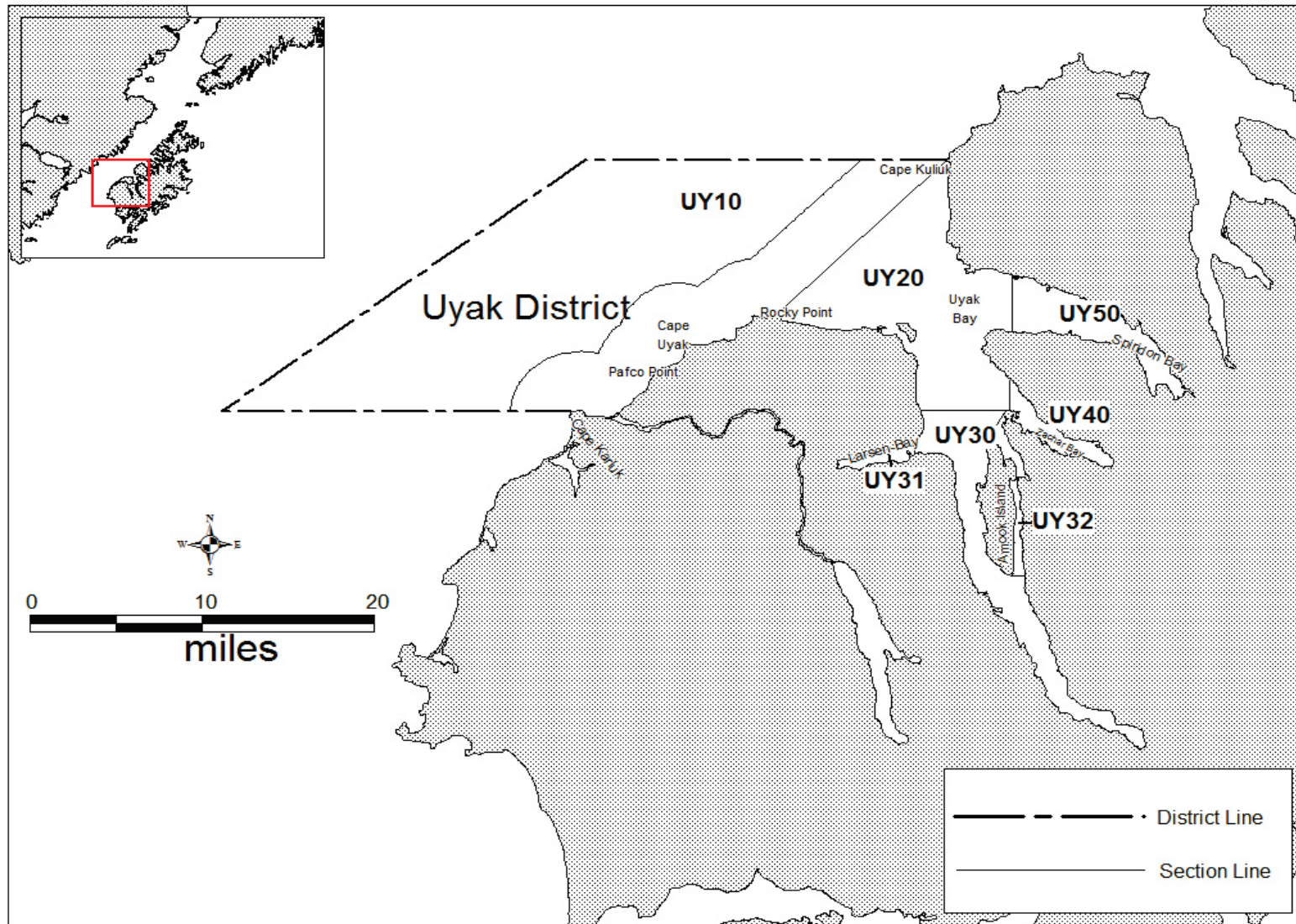


Figure 5.—Map showing the Uyak District.

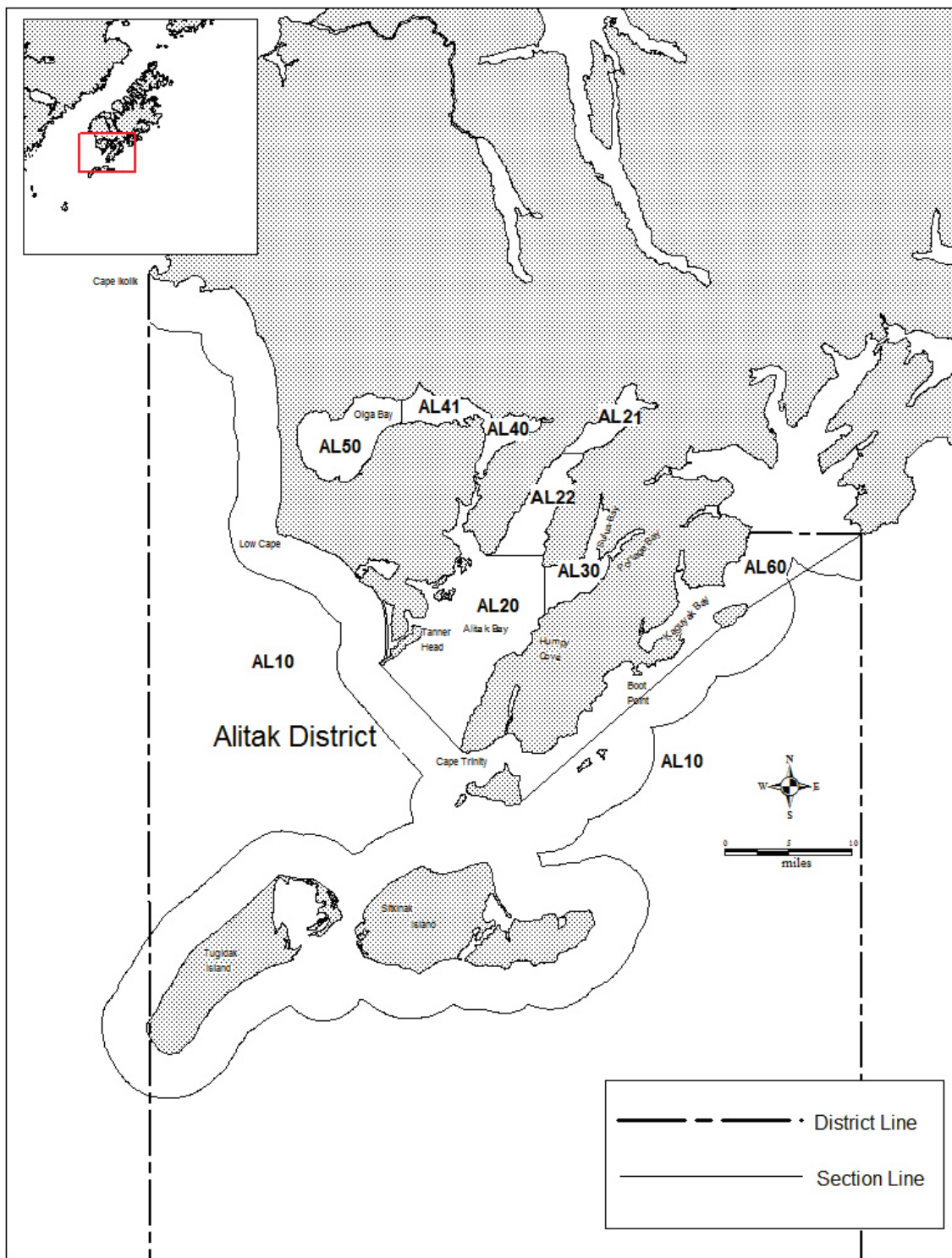


Figure 6.—Map showing the Alitak District.

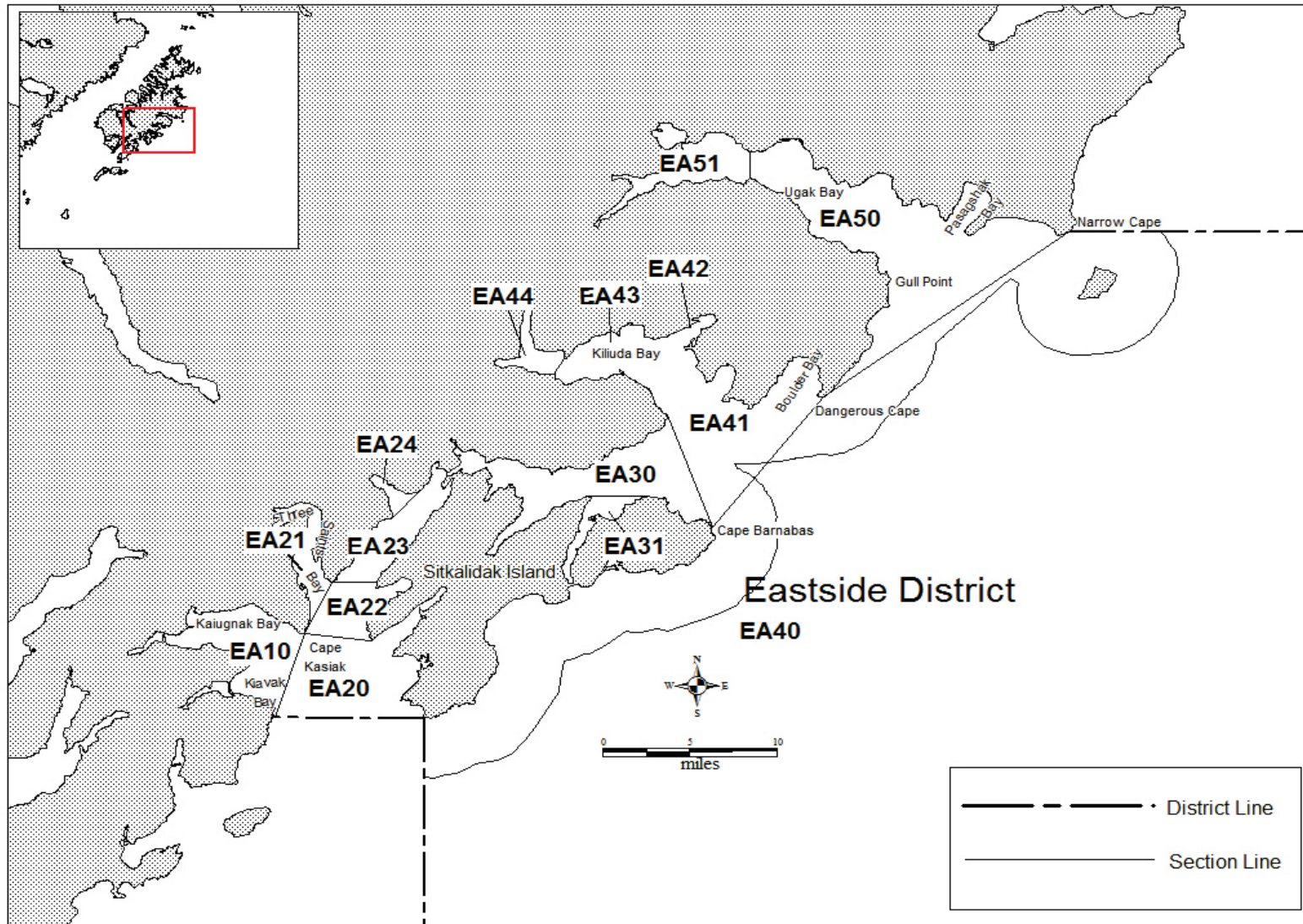


Figure 7.—Map showing the Eastside District.

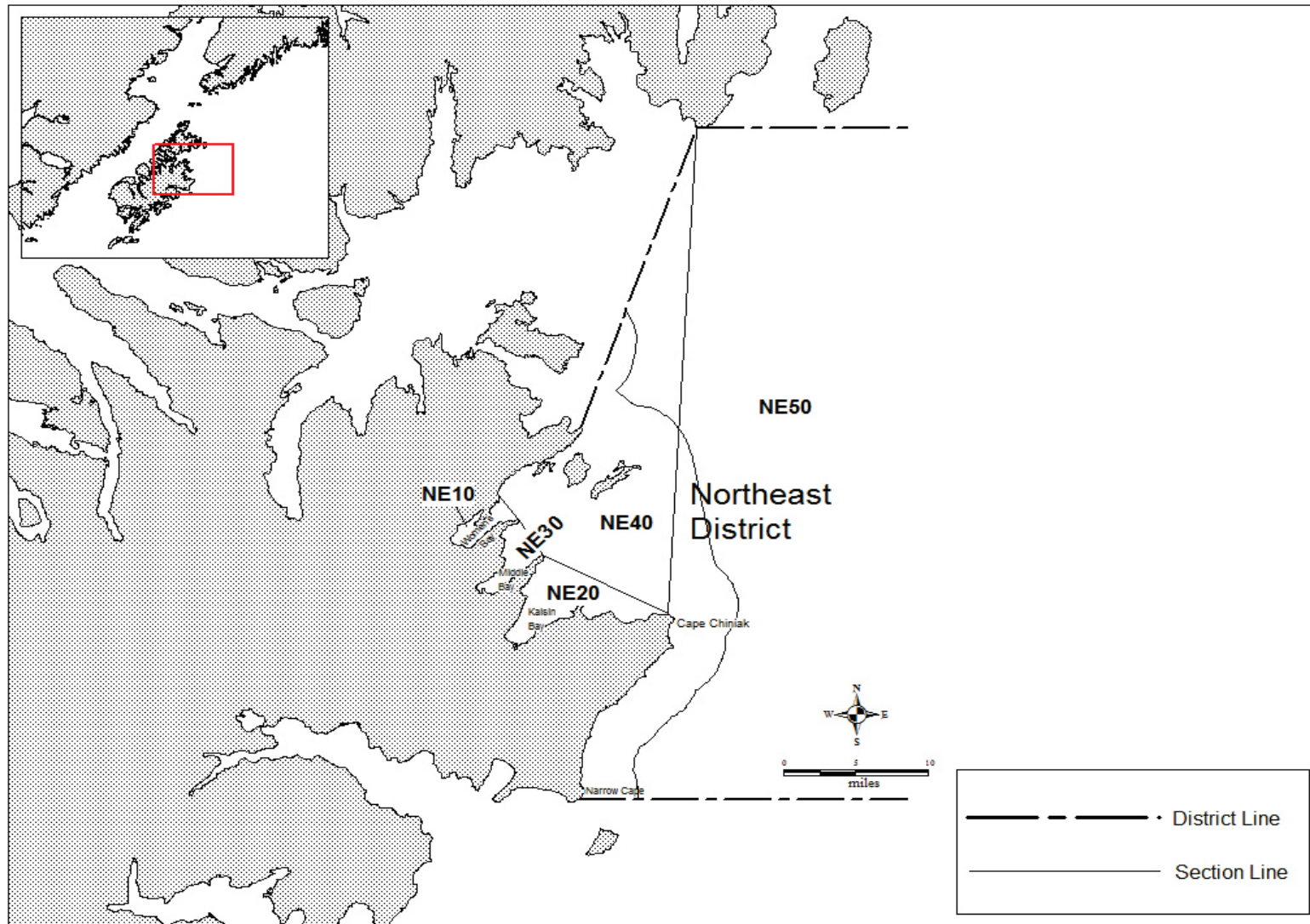


Figure 8.—Map showing the Northeast District.

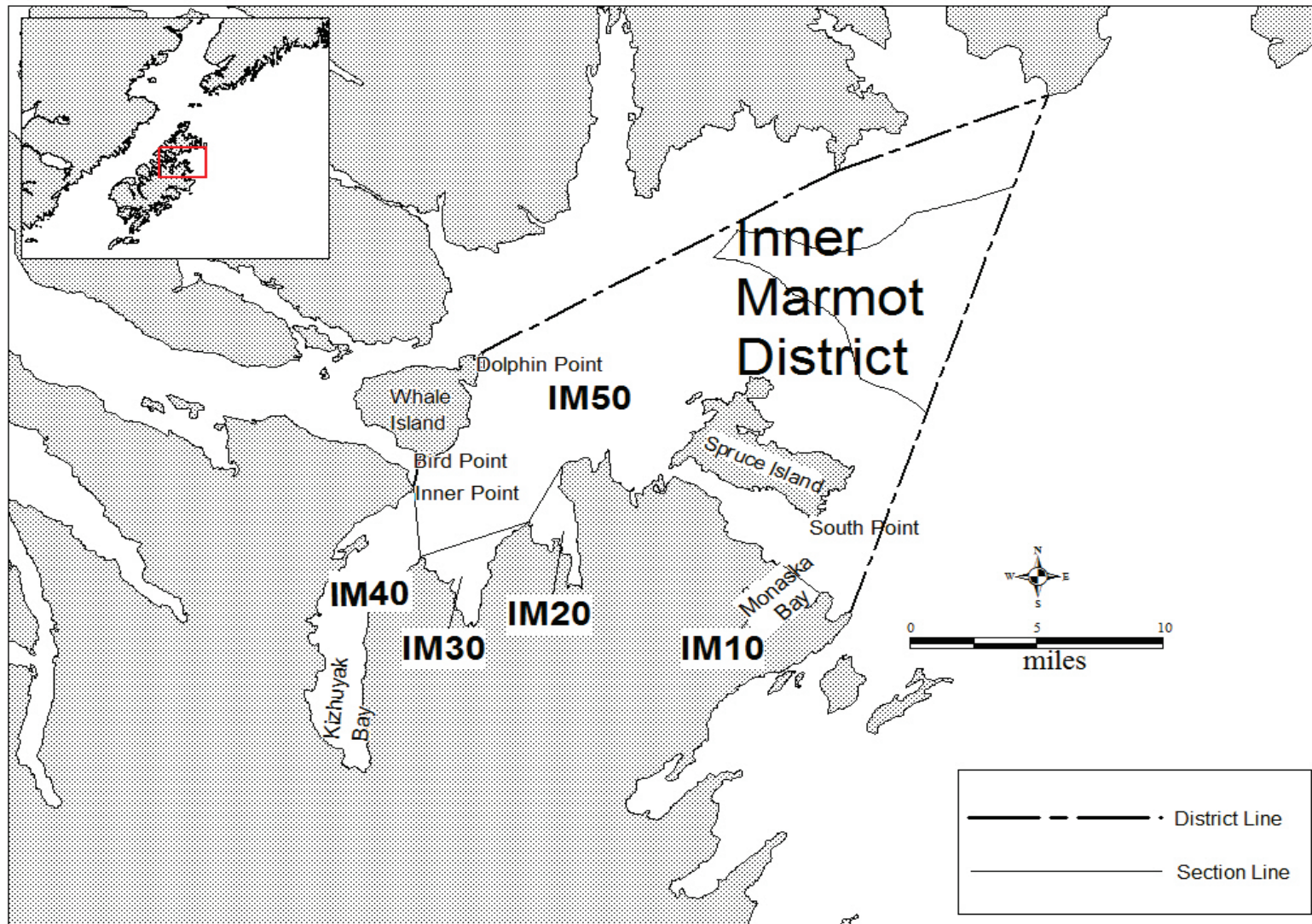


Figure 9.—Map showing the Inner Marmot District.

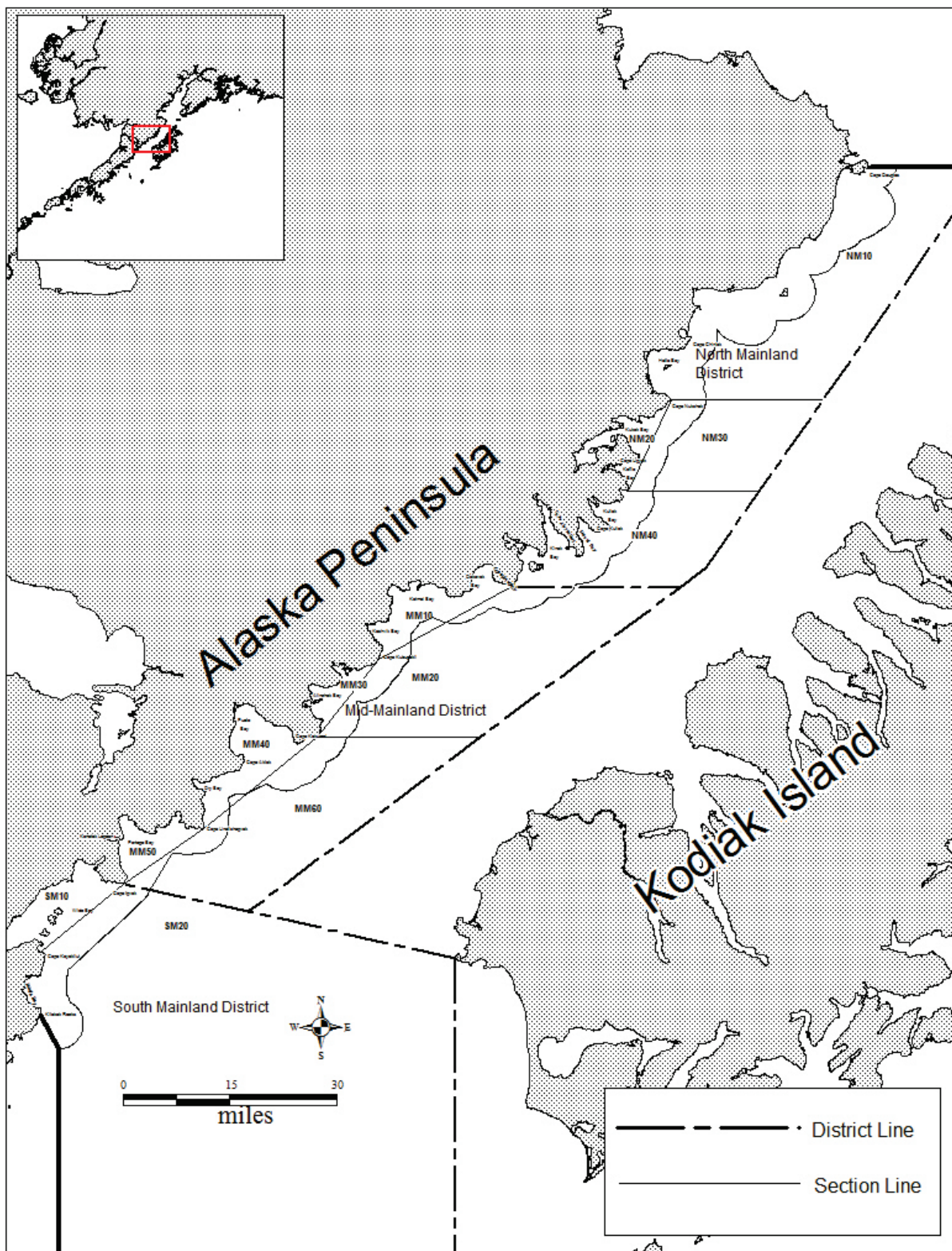


Figure 10.—Map showing the Mainland districts.

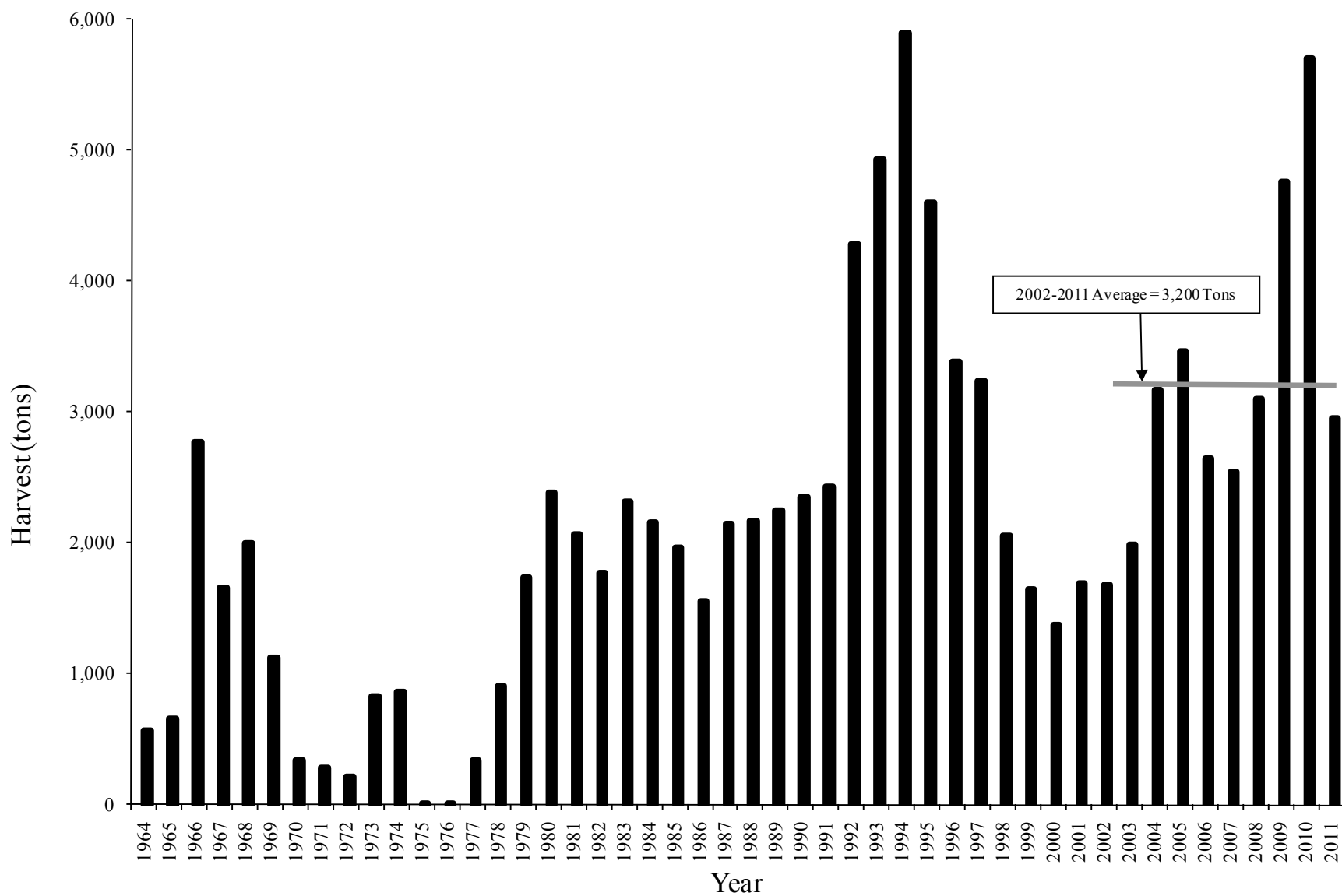


Figure 11.—Herring sac roe commercial fishery harvest in the KMA, 1964 through 2011.

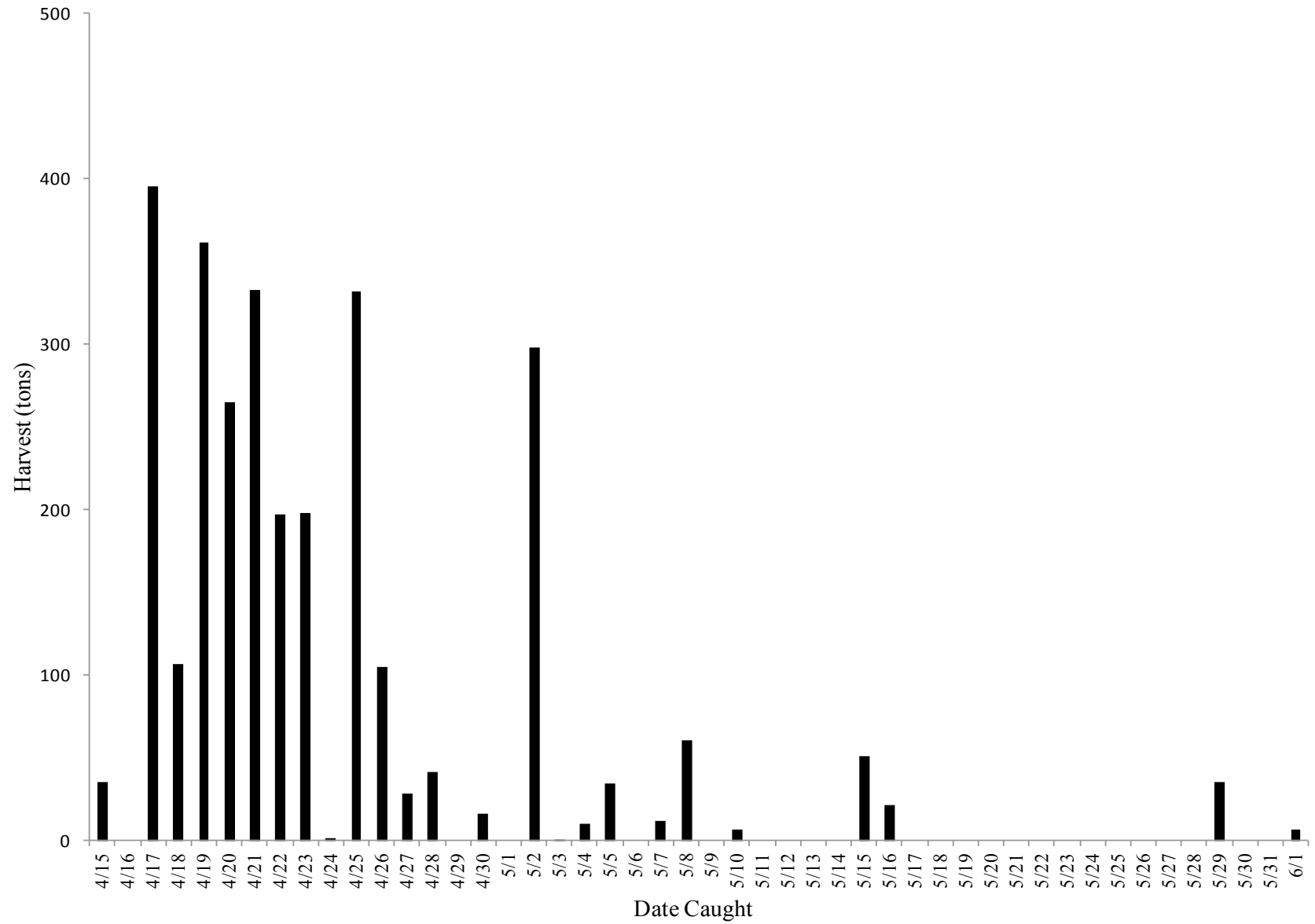


Figure 12.—Herring sac roe fishery harvest by day in the KMA, 2011.

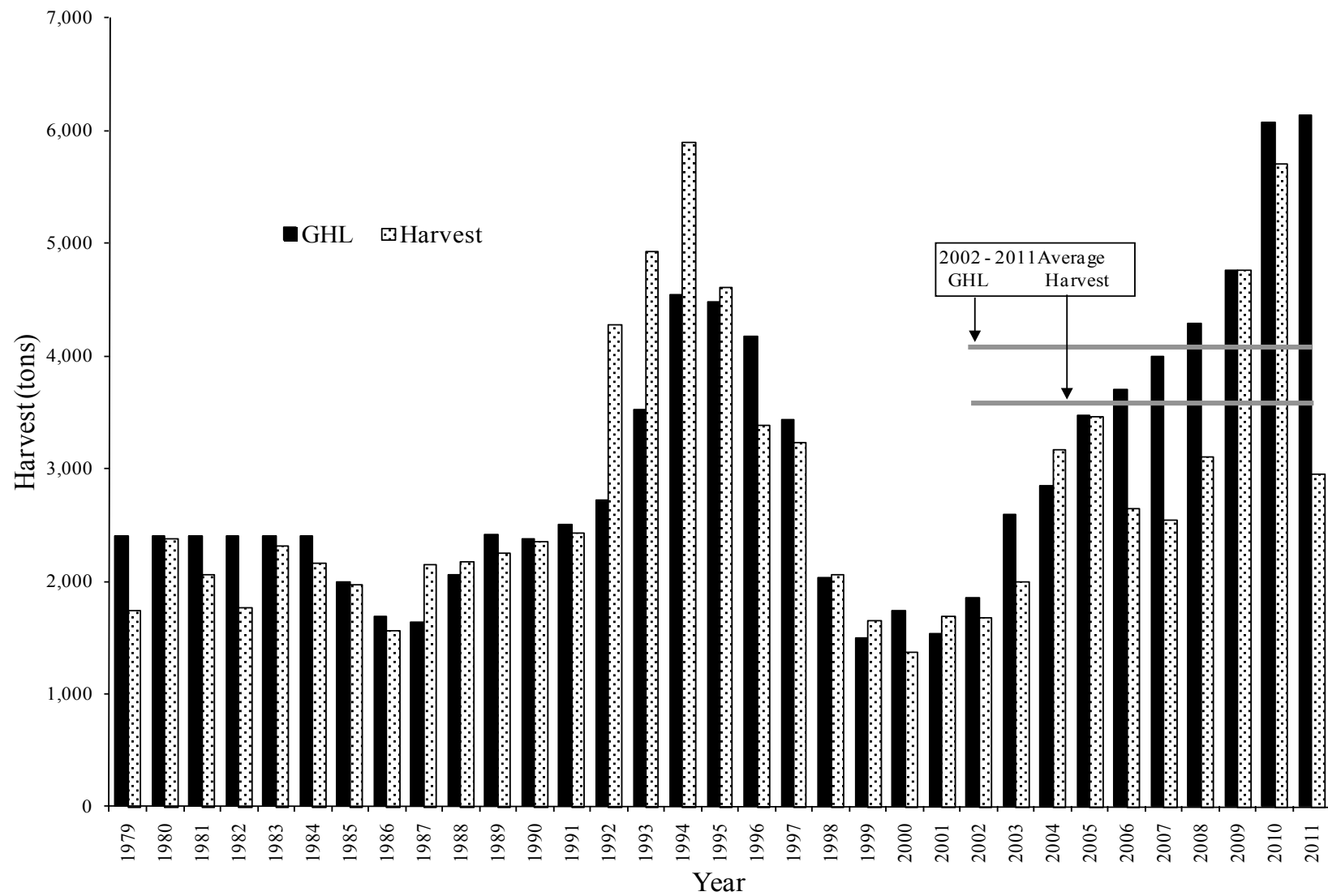
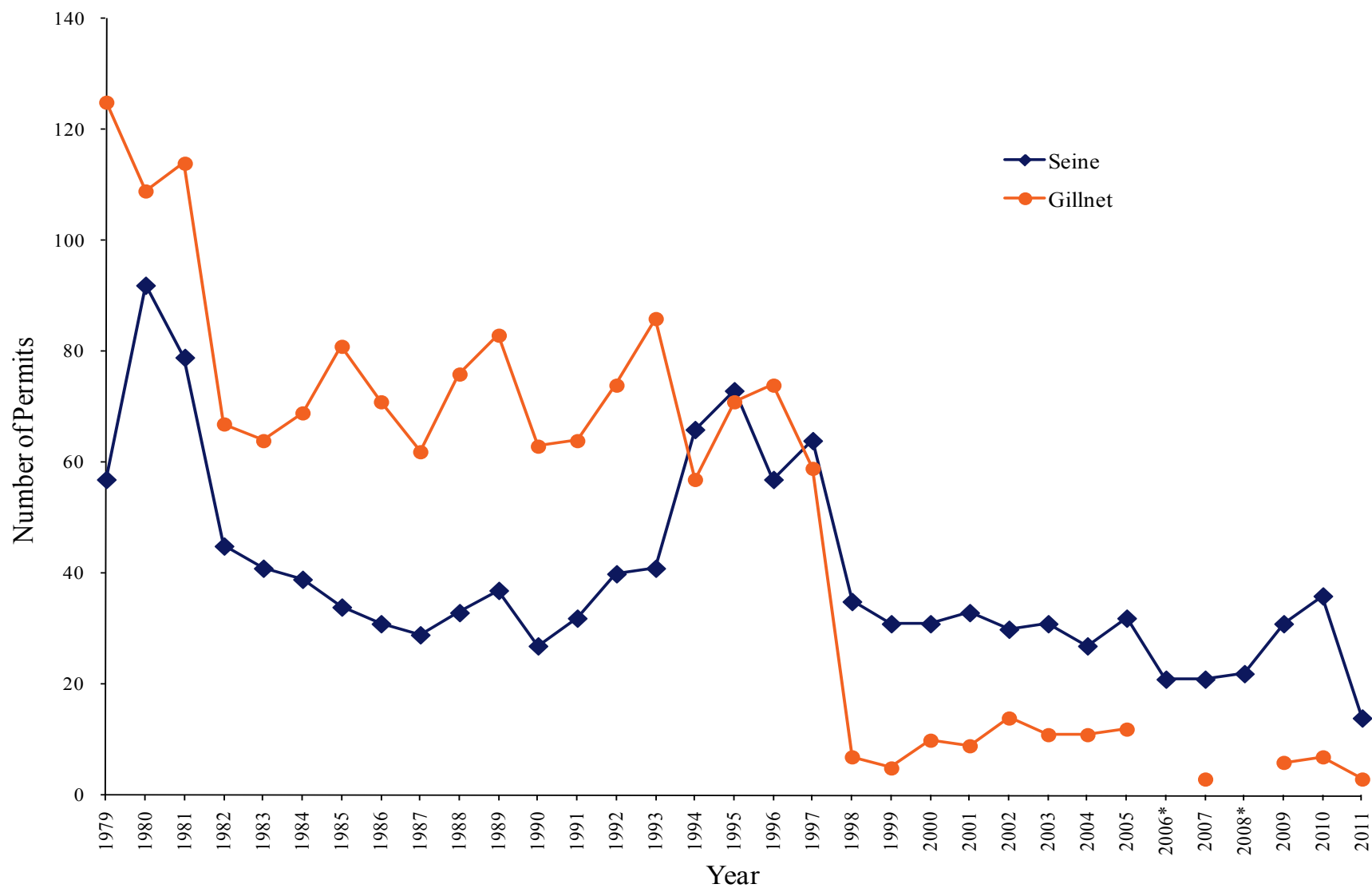


Figure 13.—Comparison of guideline harvest levels (GHLs) to the herring sac roe commercial harvest, KMA, 1979 through 2011.



*2006 and 2008 gillnet data is confidential

Figure 14.—Herring sac roe commercial fishery participation, by gear type in the KMA, 1979 through 2011.

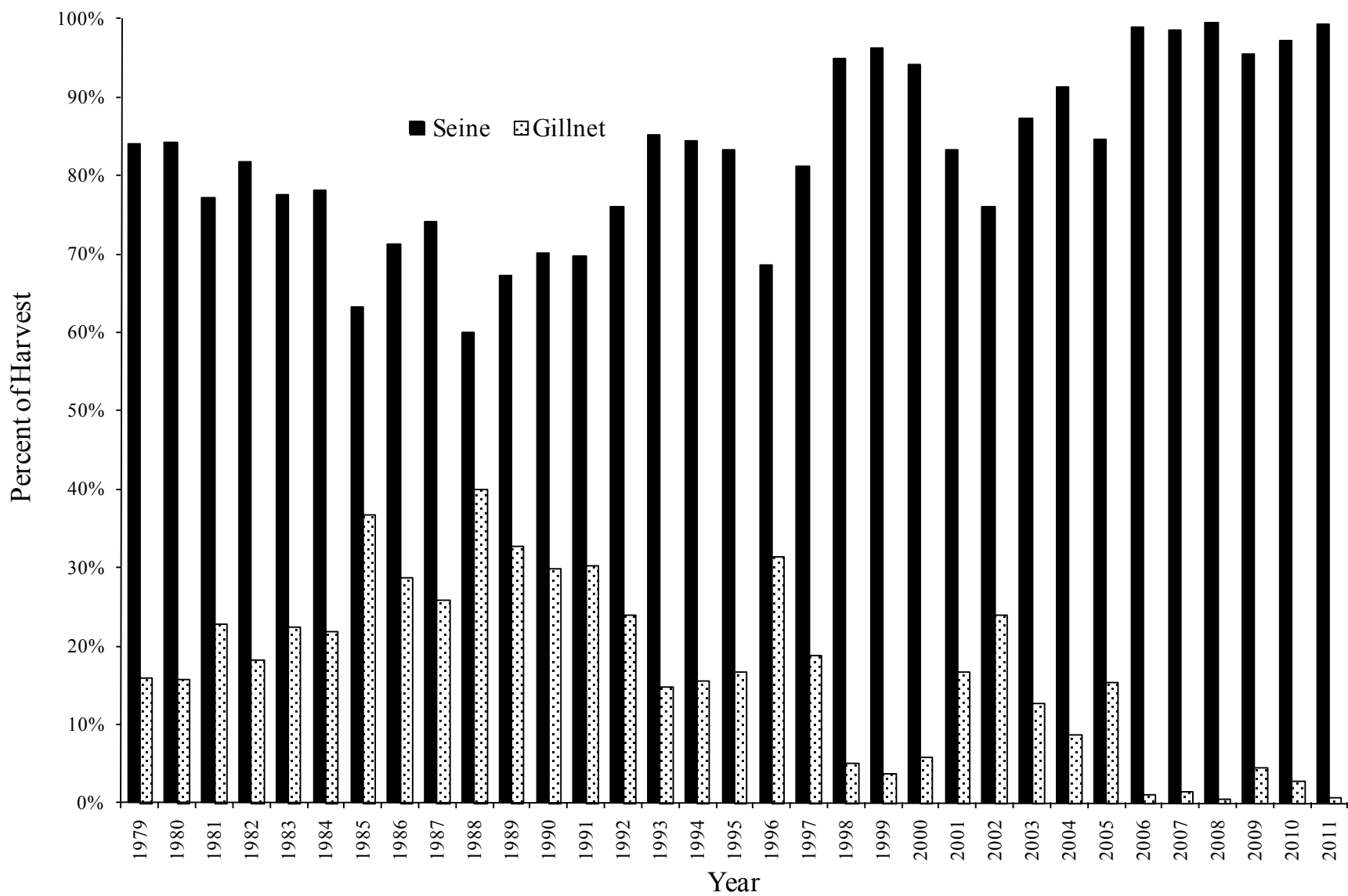


Figure 15.—Percent of the total harvest taken by gear type in herring sac roe commercial fishery, KMA, 1979 through 2011.

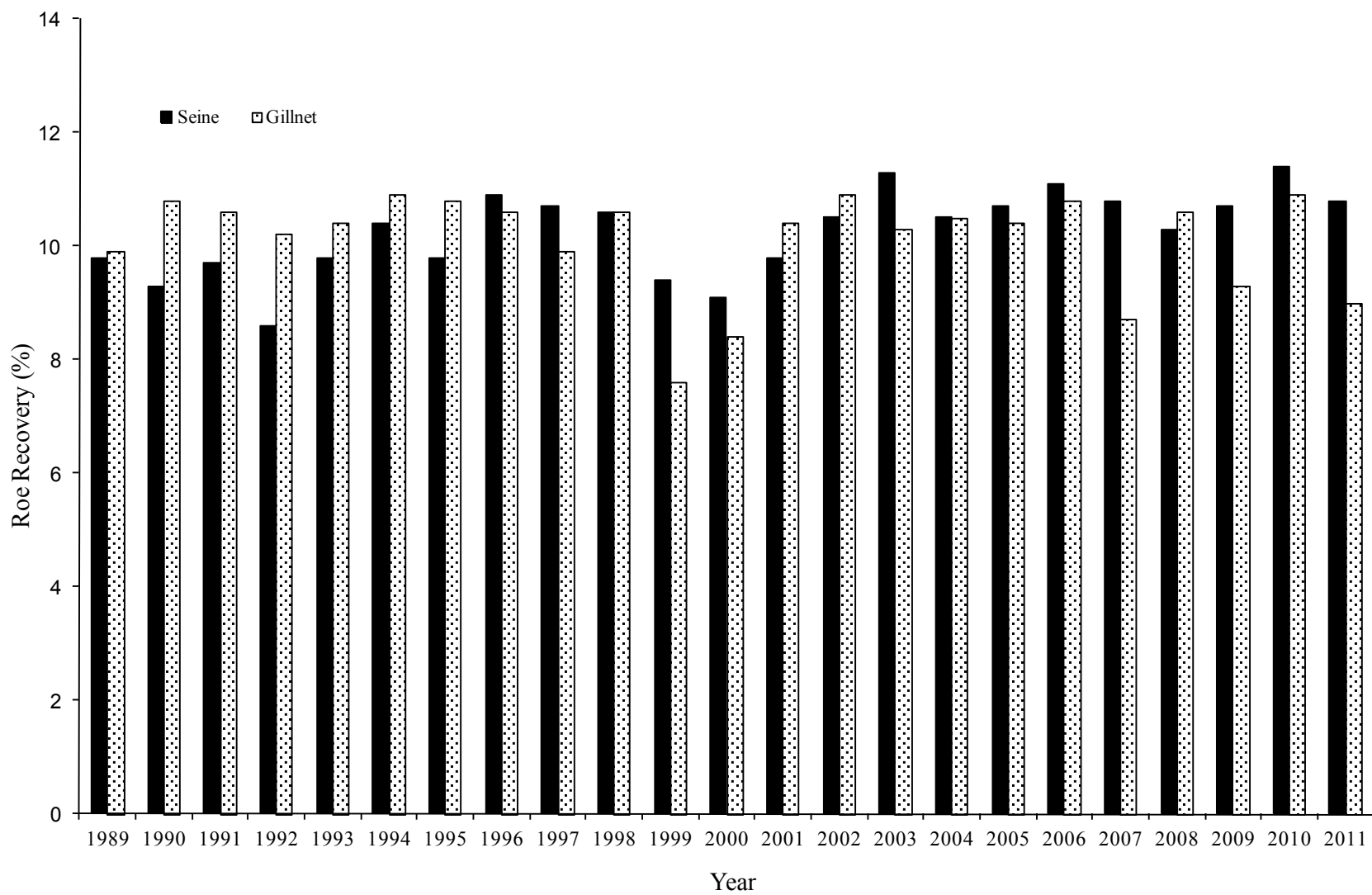
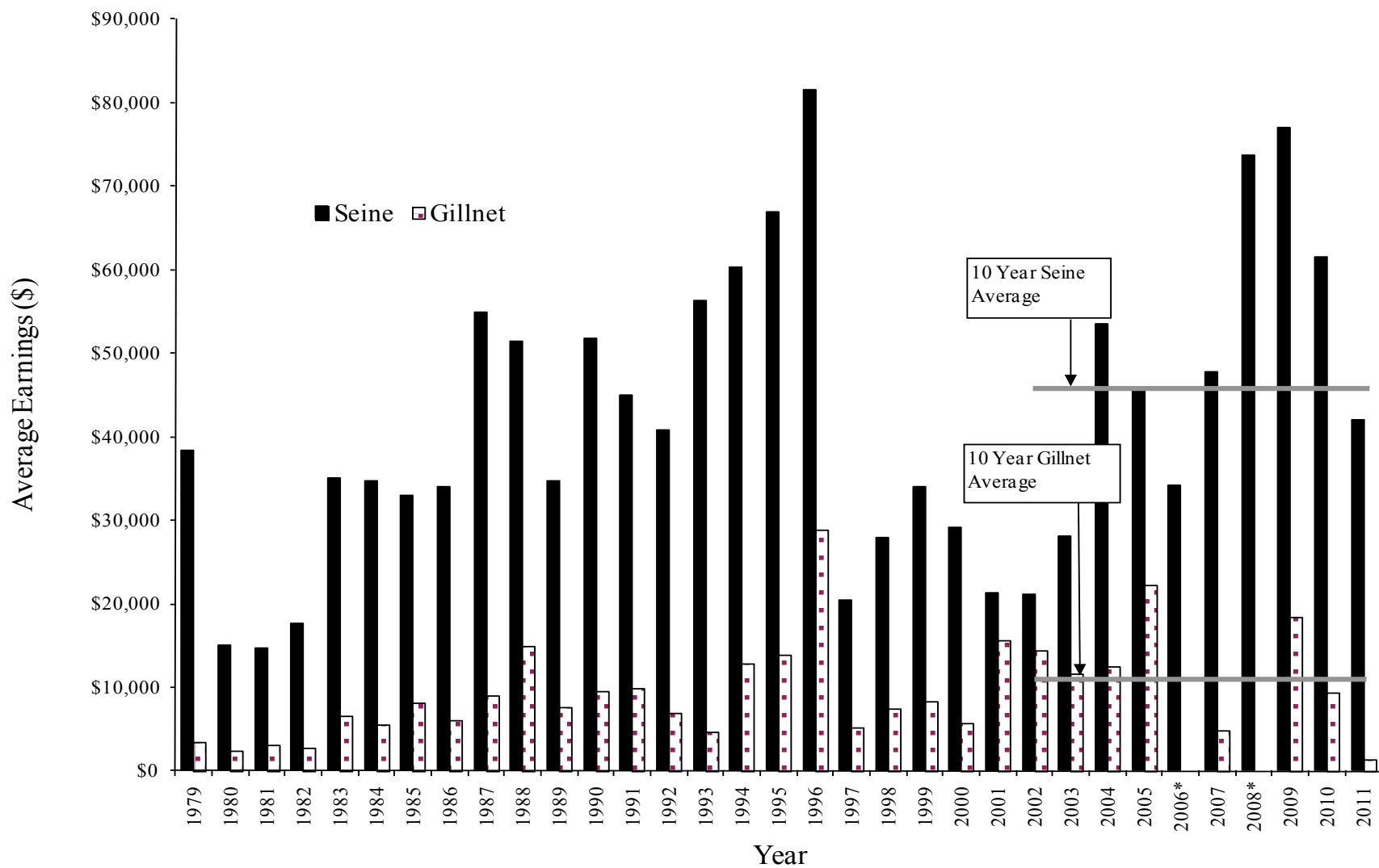


Figure 16.—Herring sac roe fishery, roe recovery in the KMA, 1989 through 2011.



* 2006 and 2008 gillnet data is confidential

Figure 17.—Average earnings by gear type for herring sac roe commercial fisheries, KMA, 1979 through 2011.

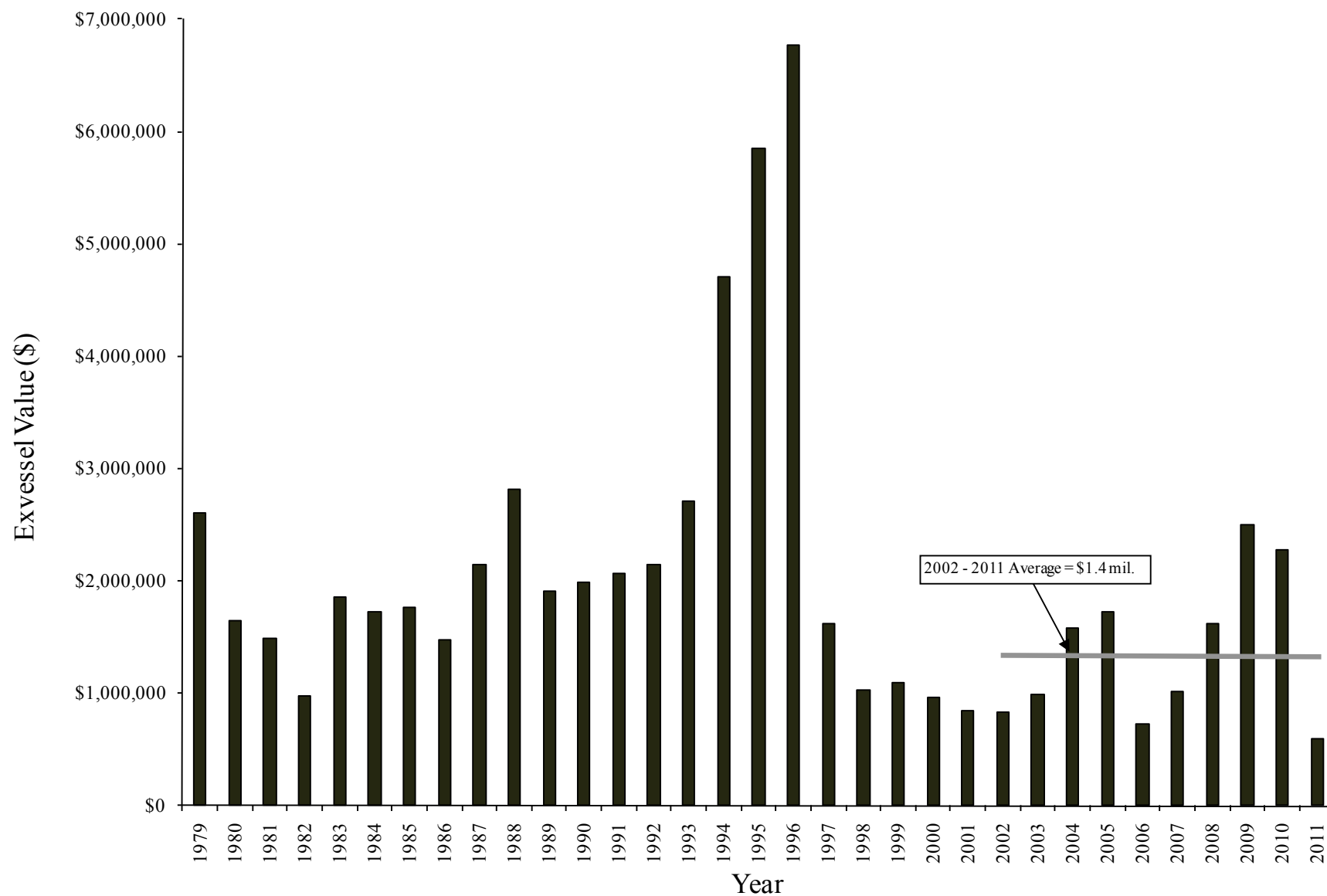


Figure 18.—Total exvessel value for herring sac roe commercial fisheries, Kodiak Management Area, 1979 to 2011.

**APPENDIX A. SUMMARY OF EMERGENCY ORDERS
ISSUED FOR THE HERRING COMMERCIAL FISHERIES
IN THE KODIAK MANAGEMENT AREA, 2011**

Appendix A1.–Summary of emergency orders issued for the herring commercial fisheries in the Kodiak Management Area, 2011.

Emergency Order #	Issued	Effective:	Action Taken:
1	8:10 AM April 12	NOON April 15	<u>Open Sac Roe Fishery:</u> initial opening times and fishing periods by gear and section for sac roe herring fishery announced.
2	2:30 PM April 15	2:30 PM April 15	<u>Fishing Period:</u> Commercial herring fishing opened in the Danger Bay Section (SA40) for purse seine gear from 2:30 PM to 9:00 PM April 15.
3	5:30 PM April 15	9:00 AM April 16	<u>Fishing Period:</u> Commercial herring fishing opened in the Danger Bay Section (SA40) for purse seine gear from NOON to 9:00 PM on odd numbered days and 9:00 a.m. to NOON on even-numbered days.
4	5:00 PM April 17	5:00 PM April 17	<u>Closure:</u> The Danger Bay Section (SA40) for purse seine gear at 5:00 PM April 17.
5	6:30 PM April 17	NOON April 18	<u>Fishing Period:</u> commercial herring fishing opened in the Danger Bay Section (SA40) for gillnet gear from NOON April 18 until further notice.
6	11:15 PM April 18	11:15 AM April 18	<u>Fishing Period:</u> Commercial herring fishing opened in the Village Islands/Uganik Bay Sections (UG30, 32-34) for purse seine gear from 11:15 AM to 9:00 AM April 18 in that portion south of 57° 41.10' N. lat.
7	9:00 AM April 19	9:00 AM April 19	<u>Fishing Period:</u> Commercial herring fishing opened in the Village Islands/Uganik Bay Sections (UG30, 32-34) for purse seine gear from 11:15 AM to 9:00 AM April 18 in that portion south of 57° 41.10' N. lat.
8	10:00 AM April 19	NOON April 21	<u>Fishing Period:</u> Commercial herring fishing opened in the Outer Ugak Bay Section (EA50) for purse seine gear at NOON April 21.

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Appendix A.1–Page 2 of 3.

Emergency Order #	Issued:	Effective:	Action Taken:
9	9:00 AM April 20	9:00 AM April 20	<u>Fishing Period:</u> Commercial herring fishing opened in the Village Islands/Uganik Bay Sections (UG30, 32-34) for purse seine gear from 9:00 AM to 9:00 PM April 20 in that portion south of 57° 41.00' N. lat.
10	9:00 AM April 21	9:00 AM April 21	<u>Fishing Period:</u> Commercial herring fishing opened in the Village Islands/Uganik Bay Sections (UG30, 32-34) for purse seine gear from 9:00 AM to 9:00 PM April 21 in that portion south of 57° 41.00' N. lat.
11	9:00 AM April 22	9:00 AM April 22	<u>Fishing Period:</u> Commercial herring fishing opened in the Village Islands/Uganik Bay Sections (UG30, 32-34) for purse seine gear from 9:00 AM to NOON April 22 in that portion south of 57° 40.00' N. lat.
12	10:33 AM April 22	10:33 AM April 22	<u>Closure:</u> The Village Islands/Uganik Bay sections (UG30, 32-34) for purse seine gear at 10:33 a.m. April 22. <u>Fishing Period:</u> Commercial herring fishing opened in the Village Islands/Uganik Bay Sections (UG30, 32-34) for gillnet gear from NOON April 22 until further notice.
13	9:38 AM April 24	9:38 AM April 24	<u>Closure:</u> The Kizhuyak Bay Section (IM40) at 9:38 AM April 24.
14	8:37 AM April 26	8:37 AM April 26	<u>Closure:</u> The Outer Ugak Bay Section (EA50) at 8:37 AM April 26
15	9:00 PM April 27	9:00 PM April 27	<u>Closure:</u> The Outer Kiliuda Bay Section (EA43) at 9:00 PM April 27.
16	9:00 PM April 27	9:00 PM April 27	<u>Closure:</u> The Izhut/Kitoi/MacDonalds Lagoon sections (SA10, 20, 30) at 9:00 PM April 27.
17	11:30 AM April 29	NOON May 1	Fishing Period: Establishes the sections that will be opened to both gear types beginning May 1.

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Appendix A.1–Page 3 of 3.

Emergency Order #	Issued:	Effective:	Action Taken:
18	8:30 AM May 2	8:30 AM April 23	<u>Fishing Period:</u> Commercial herring fishing opened in the Village Islands/Uganik Bay Sections (UG30, 32-34) for purse seine gear from 8:30 AM to 9:00 PM May 2 in that portion south of 57° 40.00' N. lat.
19	11:26 AM May 2	11:26 AM May 2	<u>Closure:</u> The Village Islands/Uganik Bay sections (UG30, 32-34) at 11:26 AM May 2
20	NOON May 2	NOON May 2	<u>Closure:</u> The Newman Bay Section (EA22) at NOON May 2.
21	8:30 AM May 7	9:00 AM May 8	<u>Fishing Period:</u> commercial herring fishing opened in the Shearwater Bay Section (EA42) for purse seine gear at 9:00 AM May 8 <u>Closure:</u> The Danger Bay Section (SA40) to gillnet gear at NOON May 8.
22	11:12 AM May 8	11:12 AM May 8	<u>Closure:</u> The Shearwater Bay Section (EA42) at 11:12 AM May 8. <u>Fishing Period:</u> Commercial herring fishing opened in the Inner Kiliuda Bay Section (EA44) for purse seine gear at NOON May 9.
23	11:30 AM May 14	NOON May 15	<u>Fishing Period:</u> Commercial herring fishing opened in the Womens Bay Section (NE10) for purse seine gear at NOON May 15.
24	10:00 PM May 15	10:00 PM May 15	<u>Closure:</u> The Womens Bay Section (NE10) at 10:00 PM May 15.
25	1:45 PM October 11	12:01 AM October 12	<u>F/B Fishing Period:</u> Established the initial fishing period for the food and bait fishery in the South Afognak and Uganik Districts at 12:01 AM October 12
26	9:30 AM October 12	9:30 AM October 12	<u>Closure:</u> The South Afognak district at 9:30 AM October 12.